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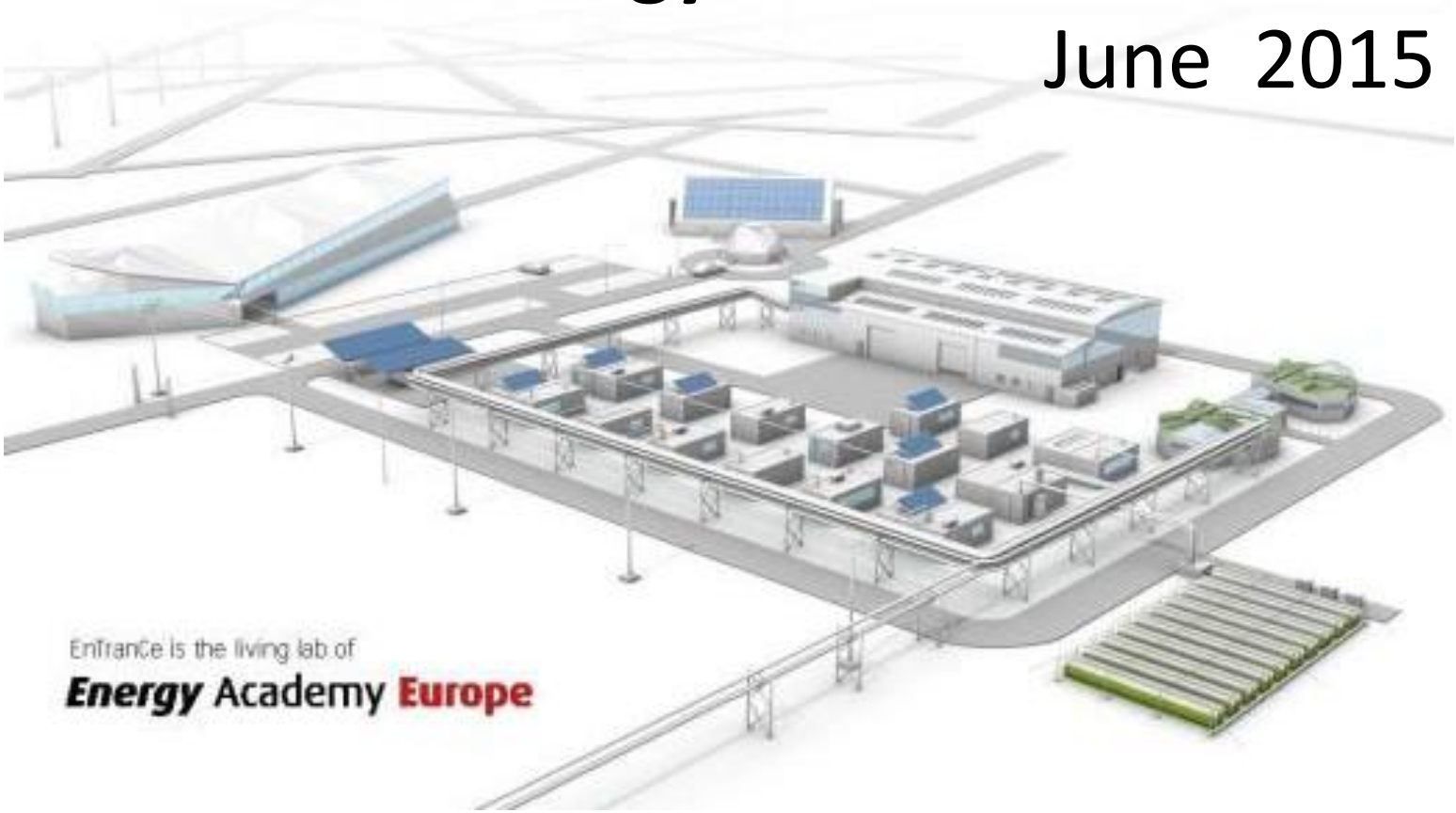
Renewable Energy in The Netherlands
June 2015



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This analyses contains information of various sources and own analyses, including various estimates.

Readers are encouraged to add, to improve the quality of the information provided.

June 2015

In a Nutshell

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- Electricity production by Solar PV reached a record level of 0.16 TWh
- Electricity production by Wind doubled compared to 2014
- Average utilization of wind capacity was 21% and for solar-PV 18%
- Net power imports increased substantially compared to the first months of 2015
- Coal usage in Dutch power generation increased by 30% y-o-y.
- Simultaneously, gas used to generate power decreased by 50% y-o-y.
- Dutch CO2 emissions are on par with 2014.
- The fraction renewable power increased from 8.7% (June 2014) to 11.4%.
- The fraction of renewable energy was 6.5%, compared to 6.1% in June 2014.

Content

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- June 2015 data
- Monthly profiles
- Monthly data
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- Miscellaneous

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SELECTED ENERGY DATA FROM JUNE 2015

Final Energy Demand

June 2015

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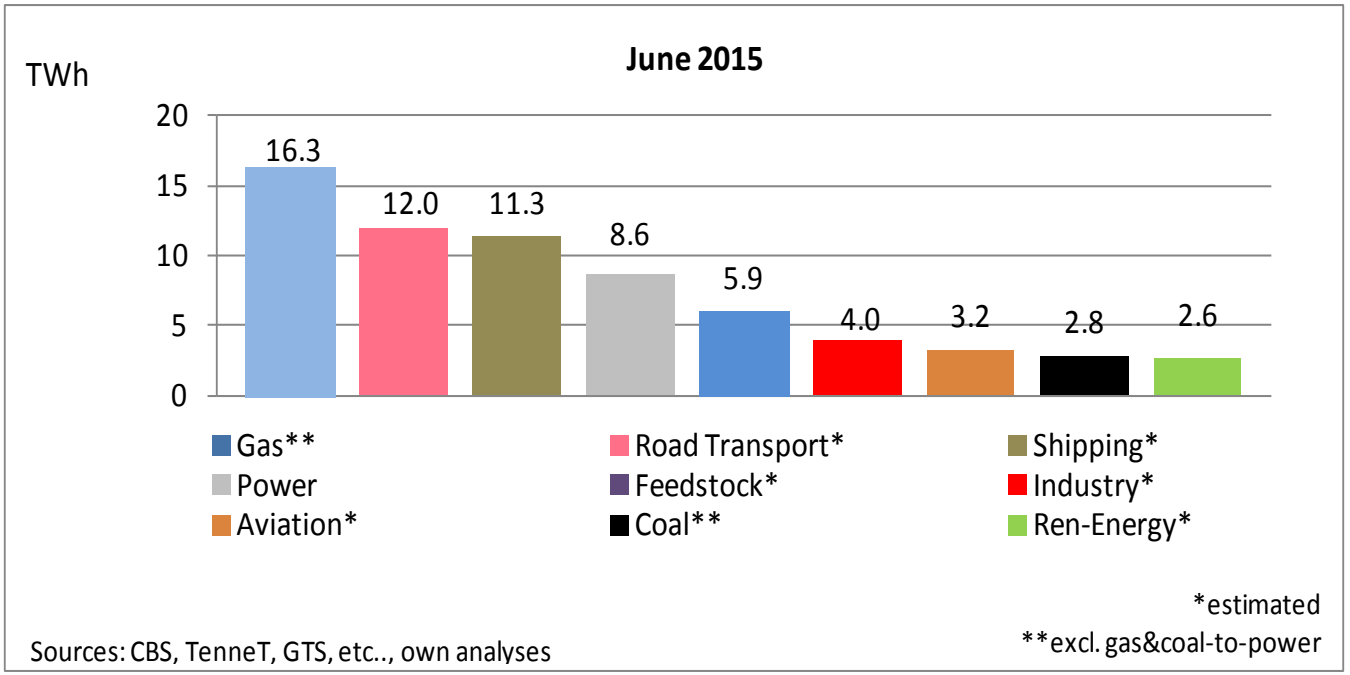

Energy is used for many different purposes. In June 2015, the most important applications were heating/gas (15 TWh) and Transport (26 TWh). Renewables are given by comparison.

Final Energy Demand

June 2015 (vs 2014)

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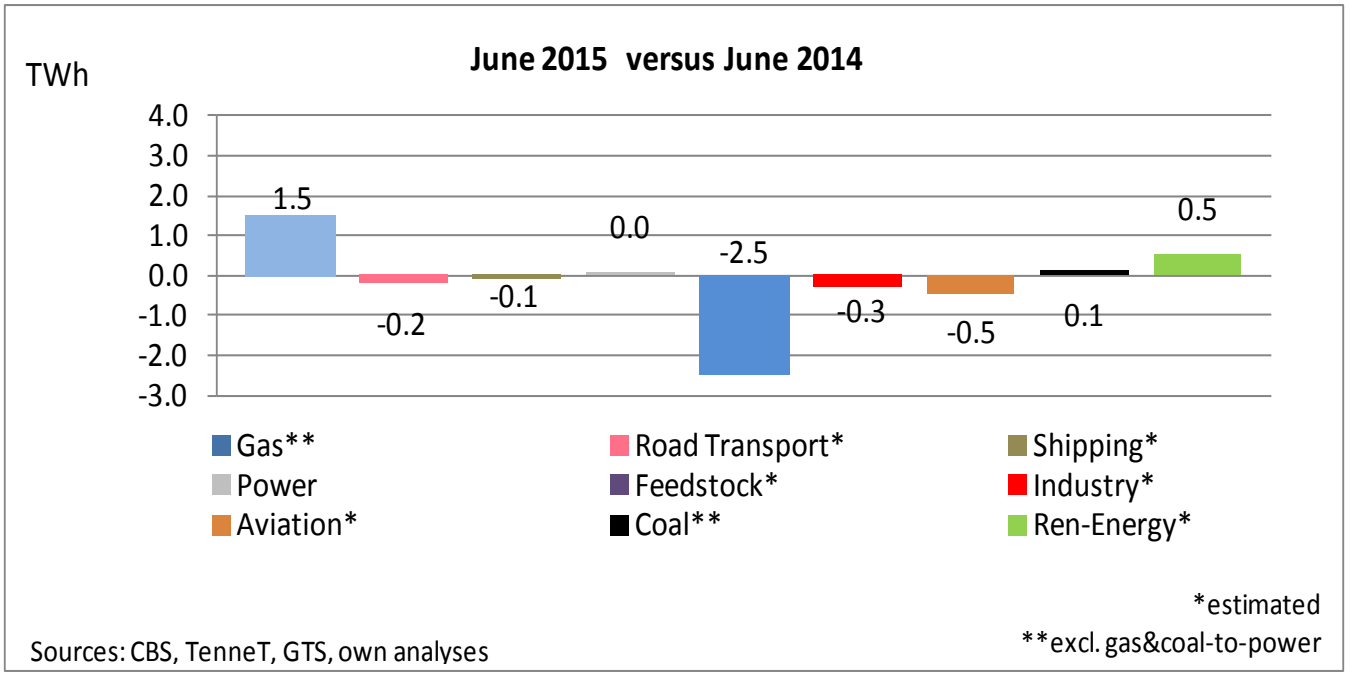
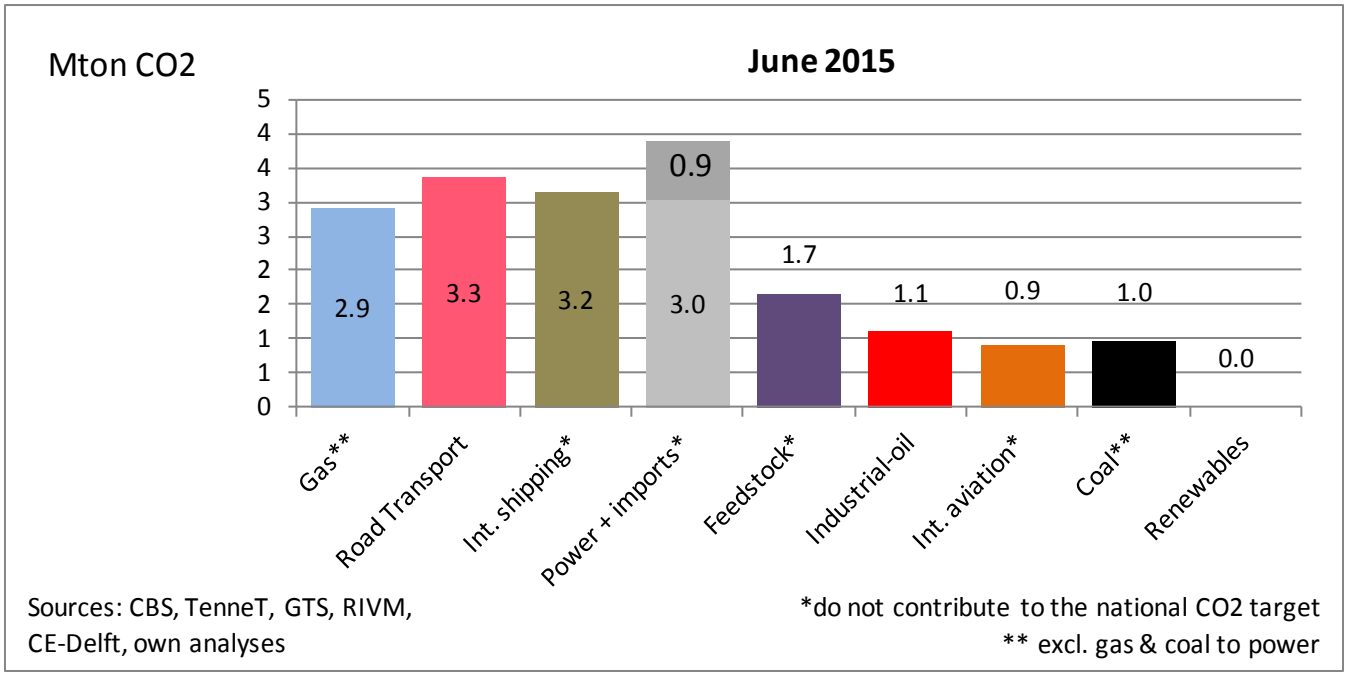


In June 2015, gas consumption was higher than last year, mainly due to lower temperatures. Based on CBS data, energy used for feedstock is estimated to be significantly lower than in June 2014. Due to higher wind and solar-PV, renewable energy was higher than last year.

CO2 Emissions

June 2015



The national CO2 emissions for June 2015, excluding power imports, feedstock and international shipping & aviation, have been estimated at 12.1 Mton. This was the same as in June 2014. The main CO2 contributions came from the power sector, road transport and gas utilization.

Power Generation Capacity June 2015

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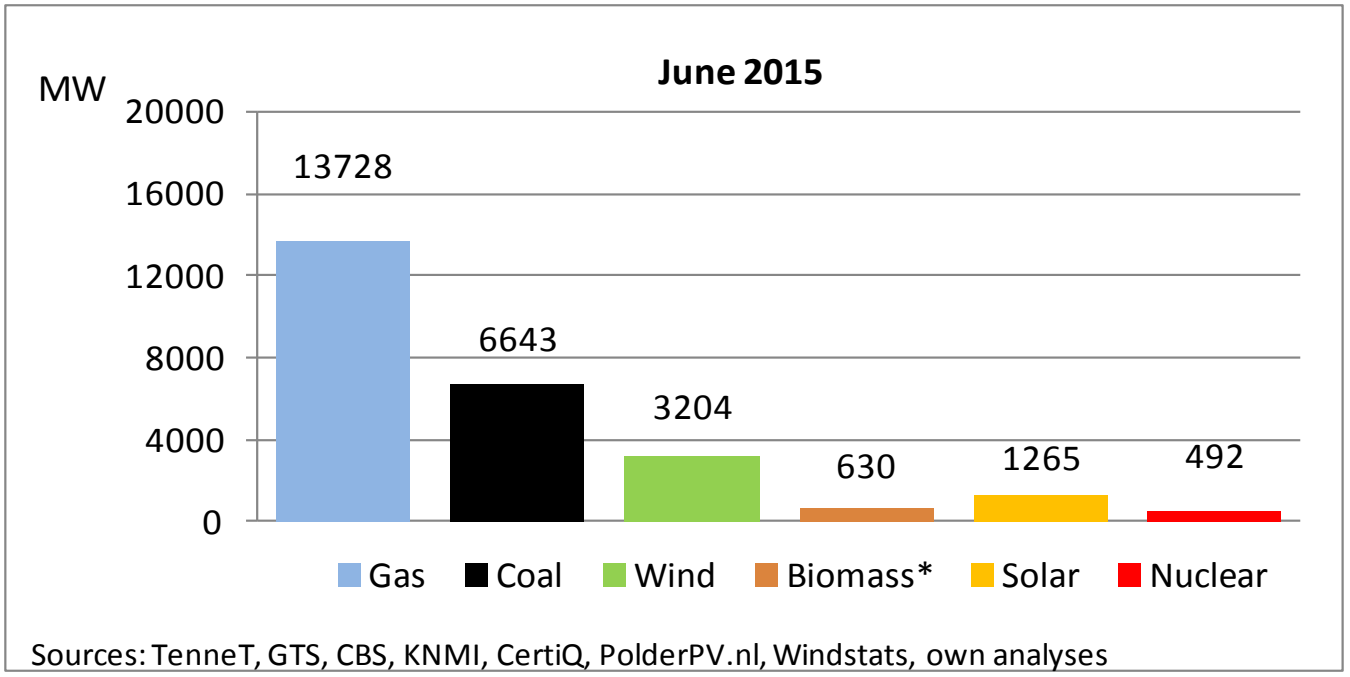
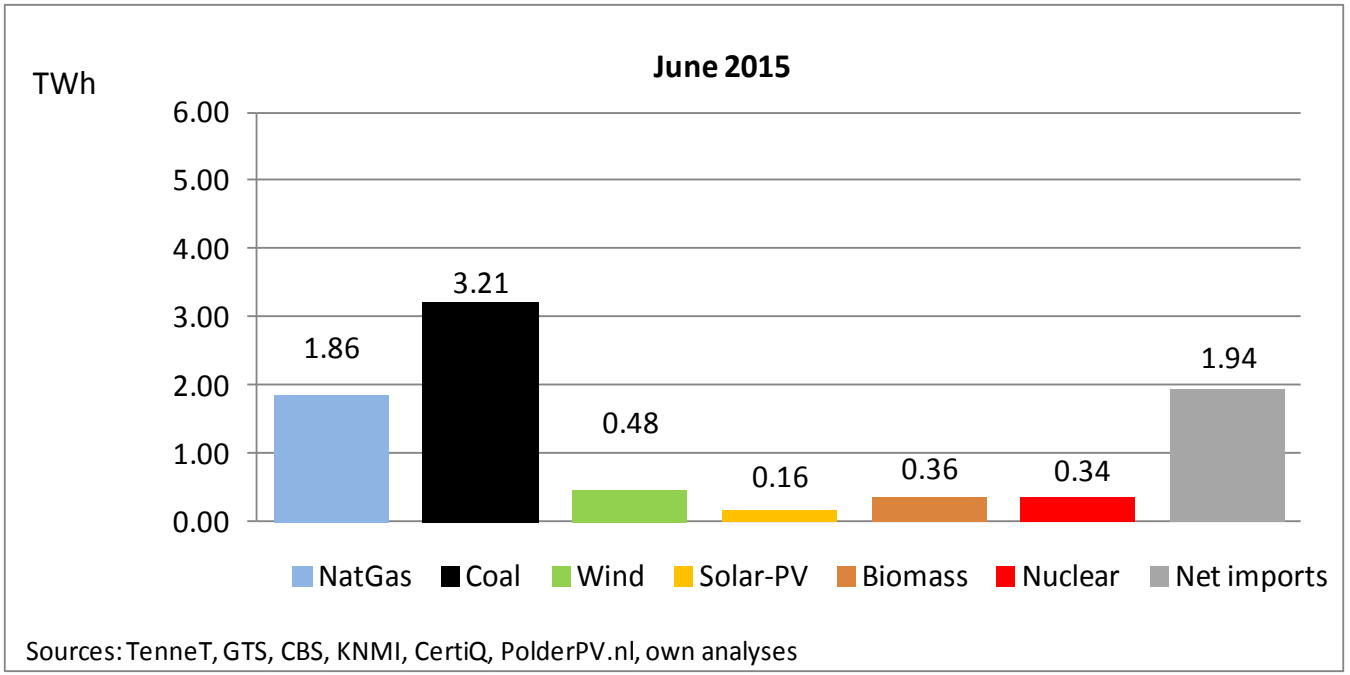


In June 2015, the available capacity in wind power has increased by 100 MW

Power Supplies

June 2015



In June 2015, power consumption was 8.6 TWh, the same as last year. Most power is generated by coal-fired power stations. The usage of coal for power generation increased by 31% y-o-y. In June 2015, the average contribution from renewables to the power system was 11.4%, compared to 8.7% in June 2014.

Power Supplies

June 2015

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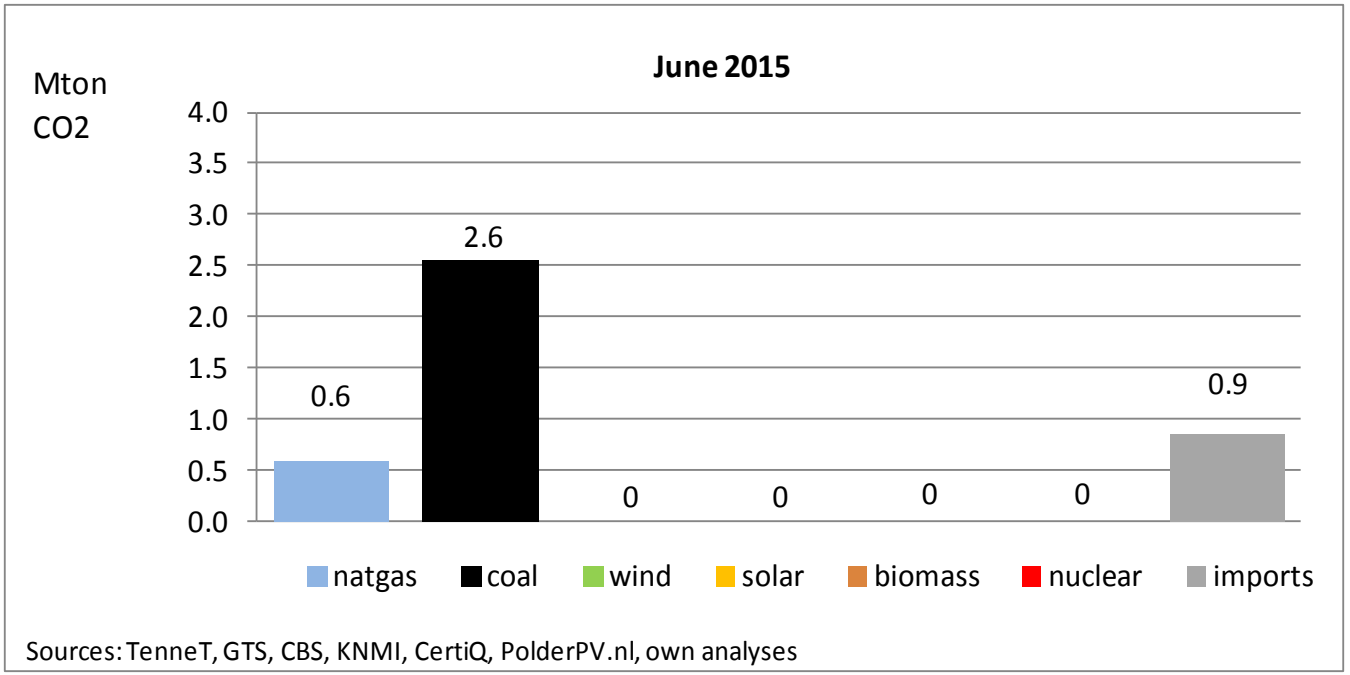

Sources: TenneT, GTS, CBS, KNMI, CertiQ, PolderPV.nl, own analyses

The CO2 emissions from imports are given for comparison, as these emissions do not contribute to the National Dutch CO2 emission level. In June 2015, 80% of the CO2 emissions from the power sector came from coal-fired power stations.

SELECTED MONTHLY PROFILES

(using daily data)

Gas and Power Demand June 2015

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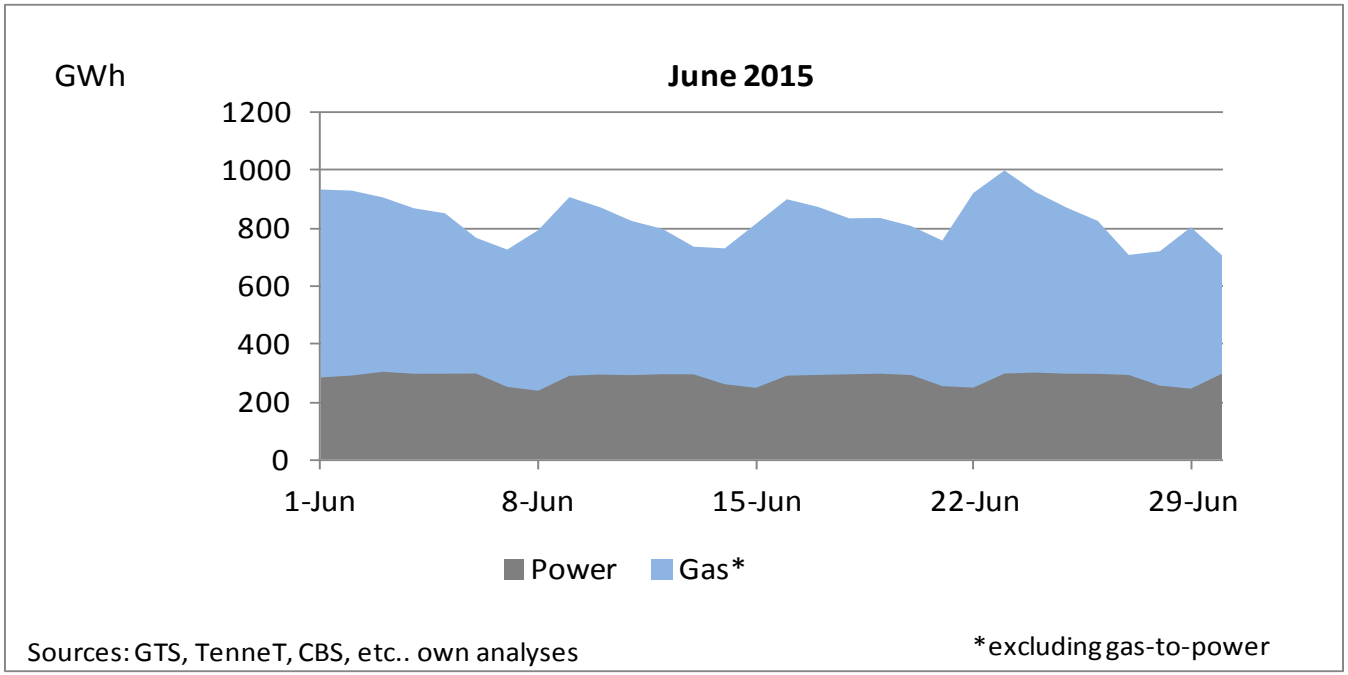
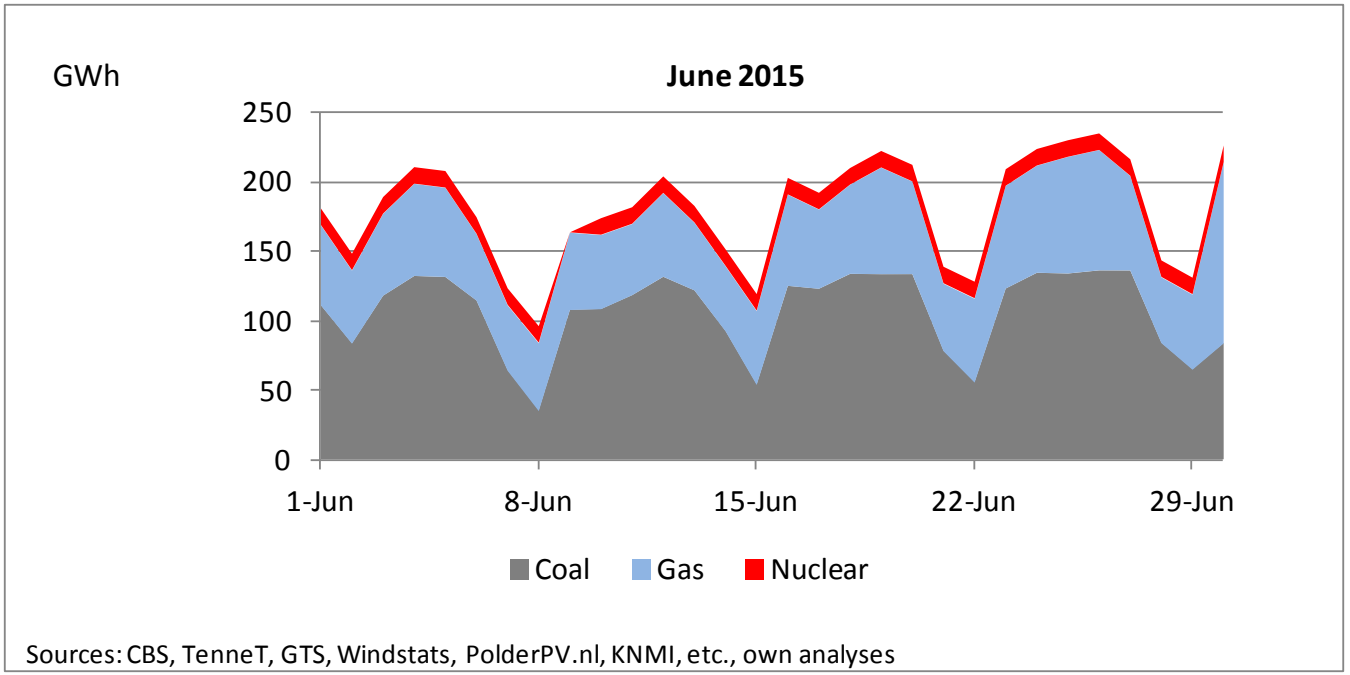


Daily power demand shows a week-weekend pattern. Daily gas demand (excluding gas demand for power) is mainly used for the heating market and affected by ambient temperature.

Conventional Power Production June 2015



Sources: CBS, TenneT, GTS, Windstats, PolderPV.nl, KNMI, etc., own analyses

Due to significant power imports, coal-fired power stations showed a week-weekend pattern. Gas-fired generation used, is typically must-run capacity (e.g. cogeneration) or assumed to be necessary to balance the system. On June 9th, the Dutch nuclear power station of Borsele was off-line.

Wind and Solar Power Production June 2015

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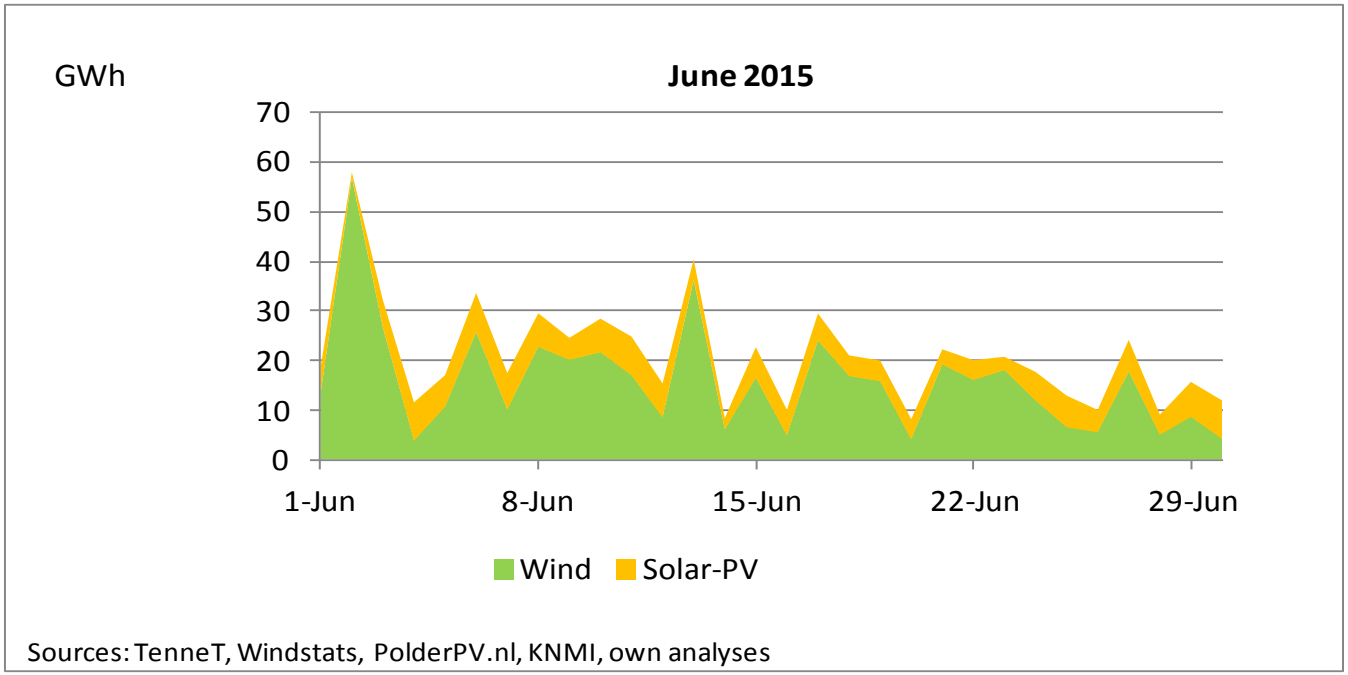

Sources: TenneT, Windstats, PolderPV.nl, KNMI, own analyses

June was rather sunny and hence, combined with a significant increase in installed capacity, Solar-PV production for the third consecutive month. 1 GWh is sufficient to provide power for a year to 300 households.

Contribution of Renewable Energy June 2015

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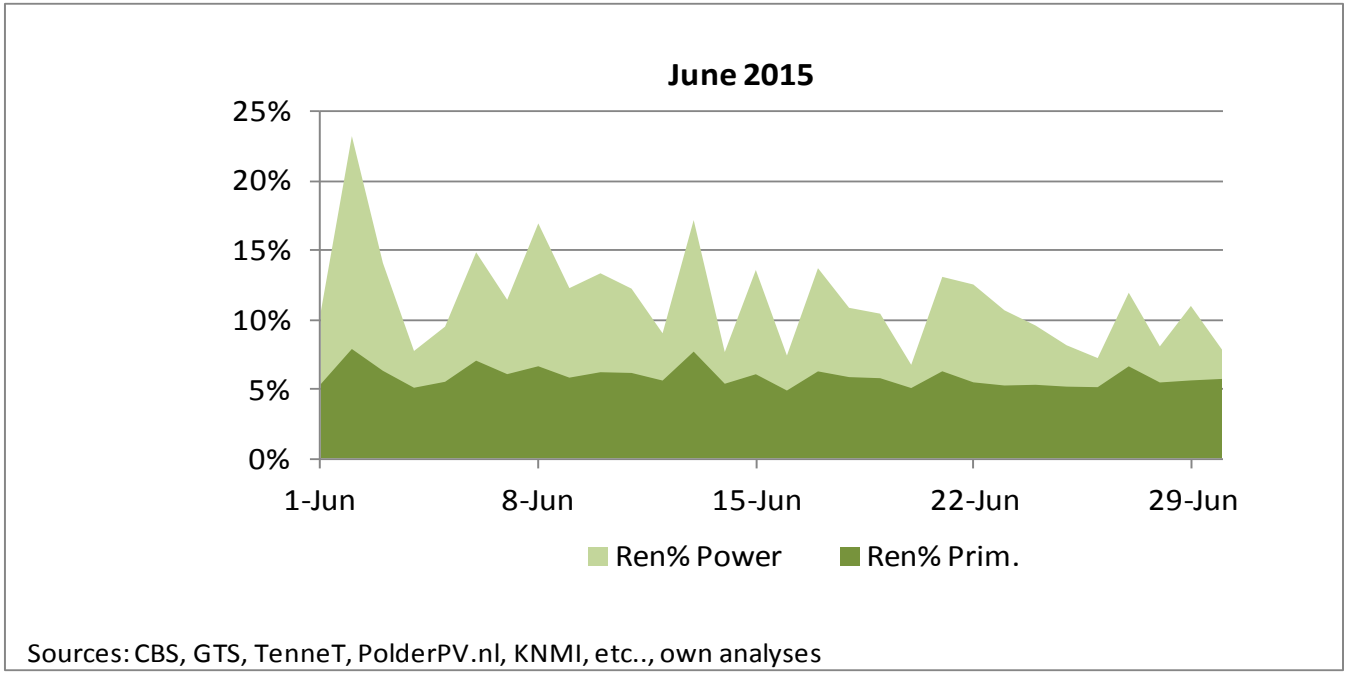

Sources: CBS, GTS, TenneT, PolderPV.nl, KNMI, etc.., own analyses

Renewable energy peaked to 7% on June 2nd, while the fraction of renewable power peaked to 23% that day. Note that the method to calculate the percentage of renewable energy has been adjusted (see sheets 26 & 27).

SELECTED MONTHLY ENERGY DATA

Gas Demand 2015 (and 2014)

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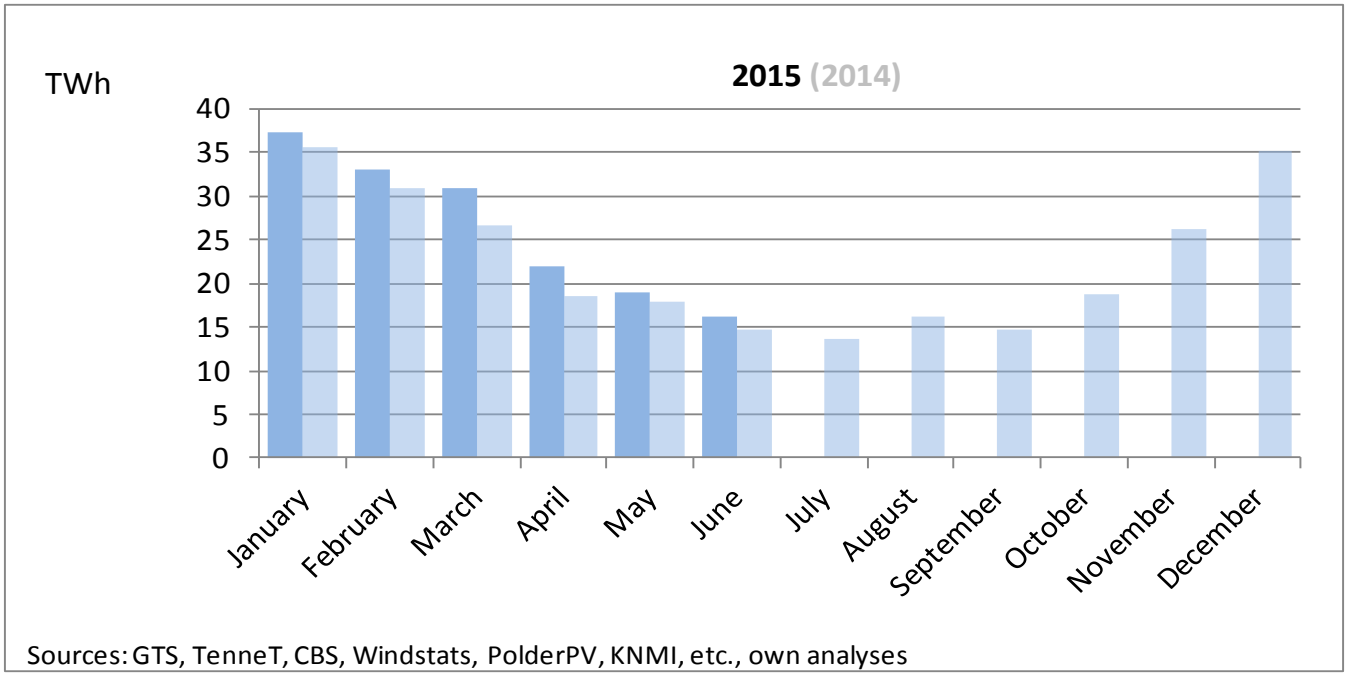
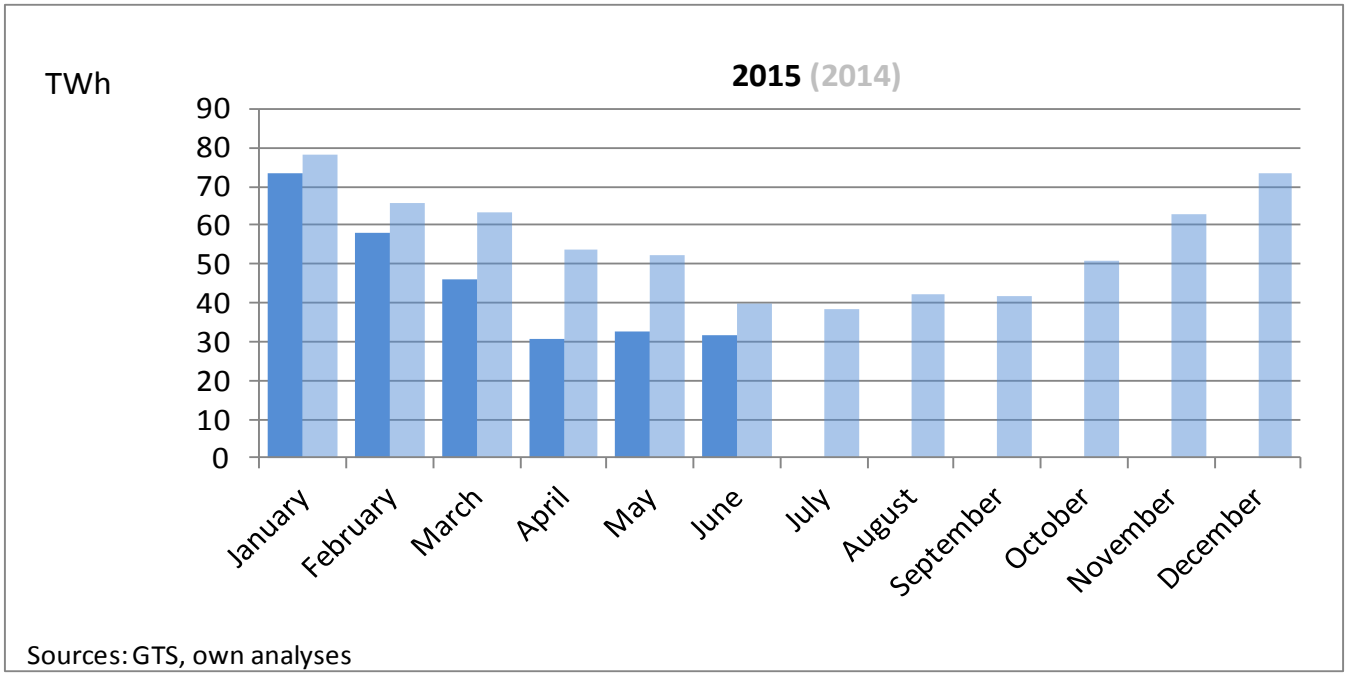


Sources: GTS, TenneT, CBS, Windstats, PolderPV, KNMI, etc., own analyses

For the six consecutive month, gas demand (excluding gas demand for power production) was higher than in in the same month in 2014, due to lower temperatures in 2015 compared to 2014

Gas Production 2015 (and 2014)

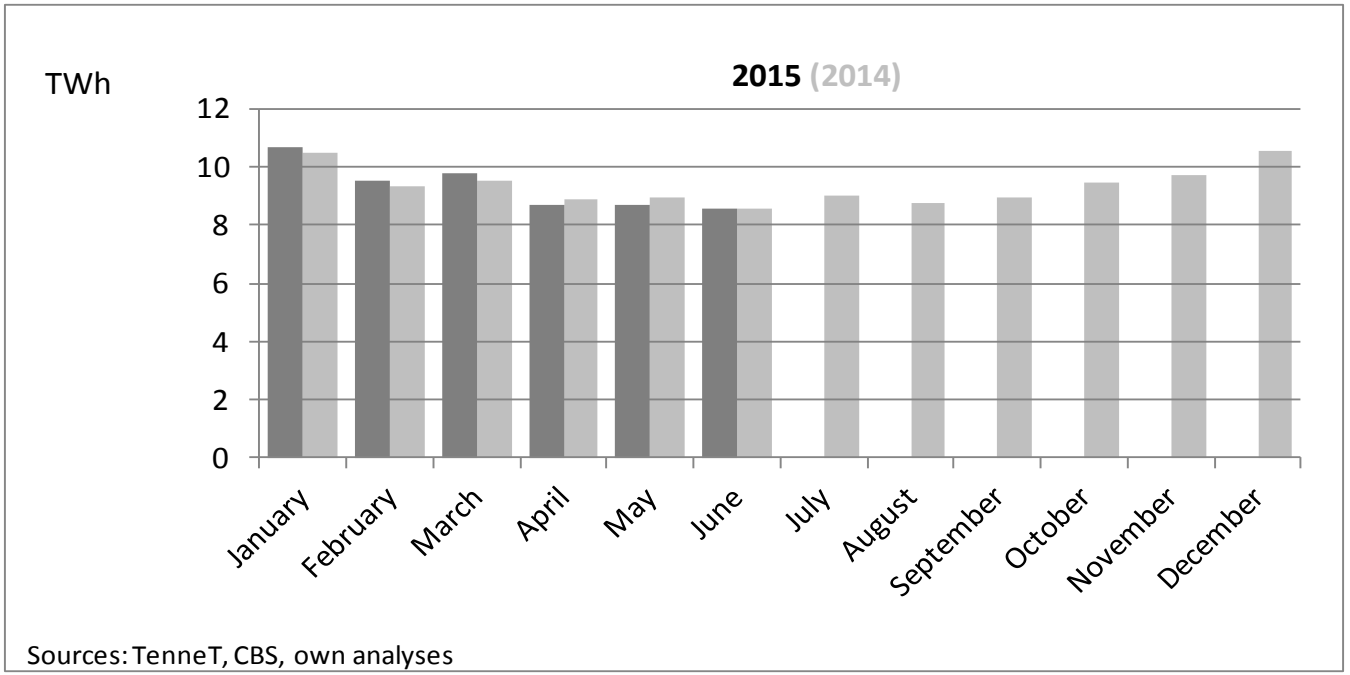


Sources: GTS, own analyses

Due to lower production from the Groningen gas field and declining gas production from the North Sea, Dutch gas production in 2015 is considerable lower than in 2014.

10 TWh gas is sufficient to supply heat to all houses in Amsterdam for two years

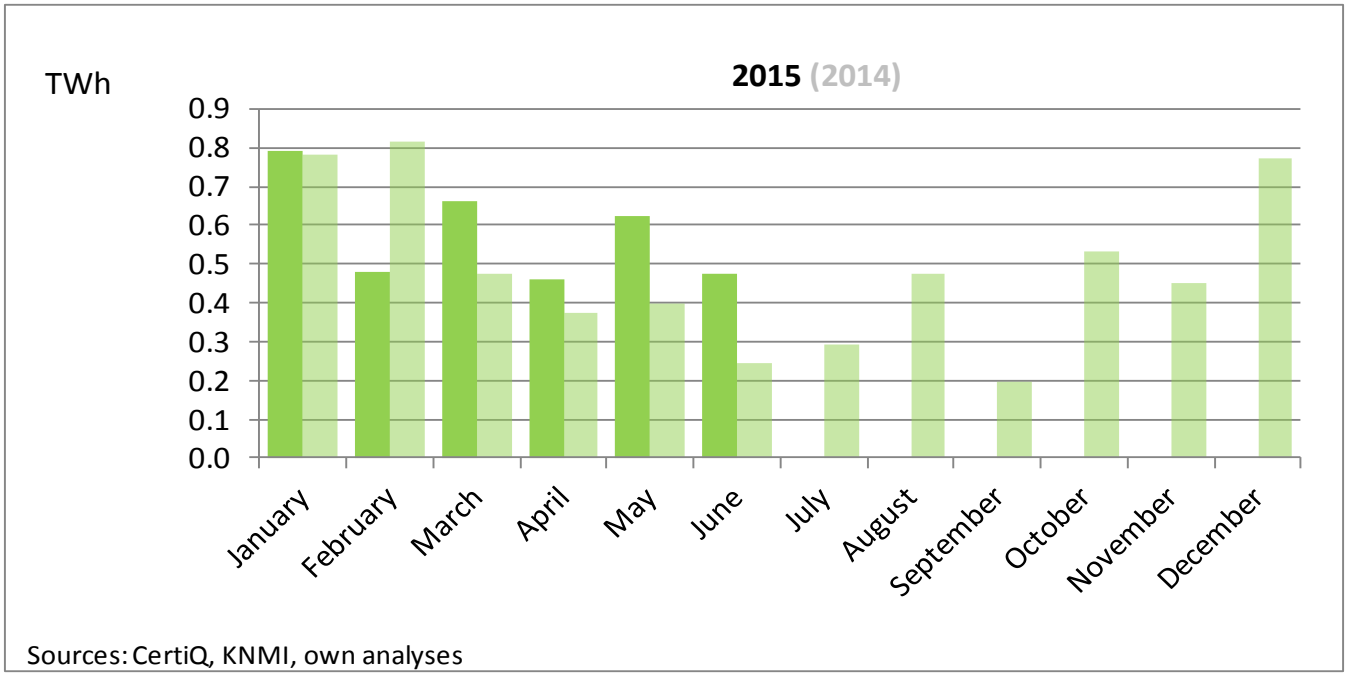
Power Demand 2015 (and 2014)



Sources: TenneT, CBS, own analyses

Power demand in June was the same as last year.

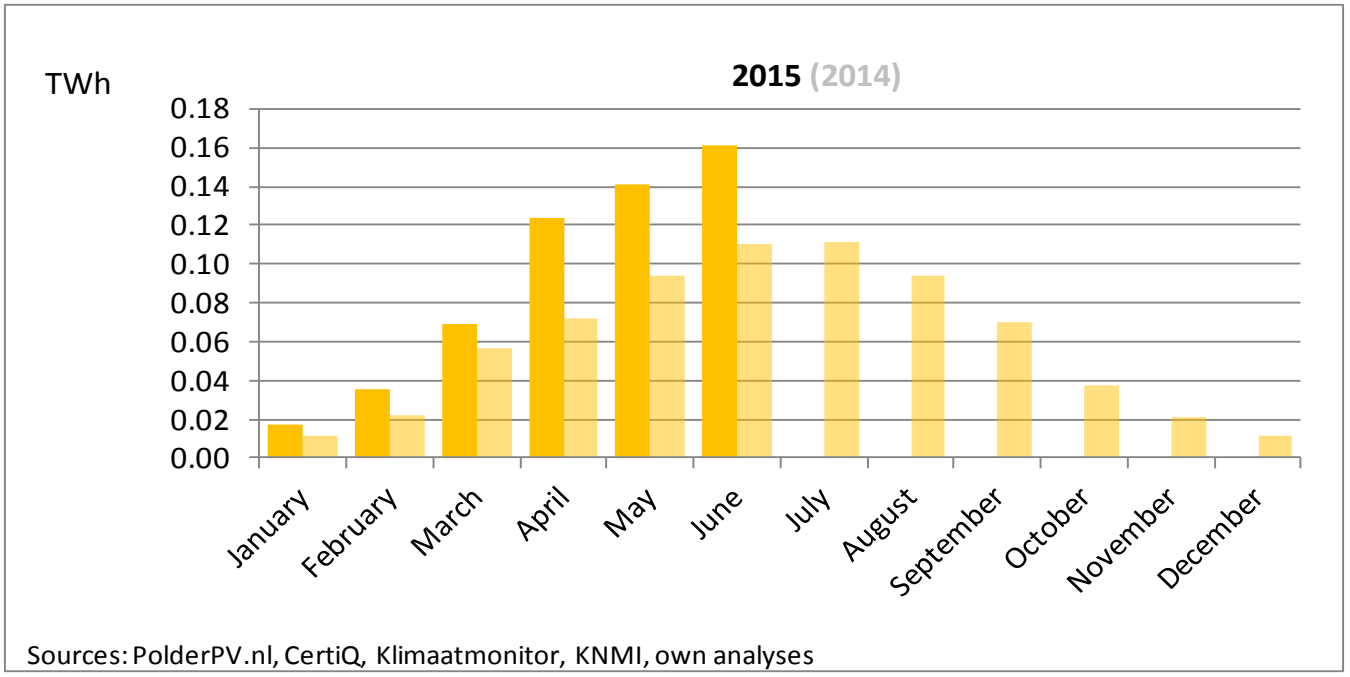
Wind Production 2015 (and 2014)



Sources: CertiQ, KNMI, own analyses

Wind power production is volatile. Wind production in June 2015 was 100% higher than in June 2014, partly due to increased wind capacity and mainly due to more wind availability. In June 2015, the average utilization of wind capacity was 21%.

Solar PV Production 2015 (and 2014)



Sources: PolderPV.nl, CertiQ, Klimaatmonitor, KNMI, own analyses

In June 2015, electricity production by Solar PV in The Netherlands reached a new record level of 161 GWh (0.16 TWh). This was 45% higher than in June 2014, mainly due to increased Solar PV capacity. In June 2015, the average utilization rate of solar-PV capacity was 18%.

Coal-to-Power 2015 (and 2014)

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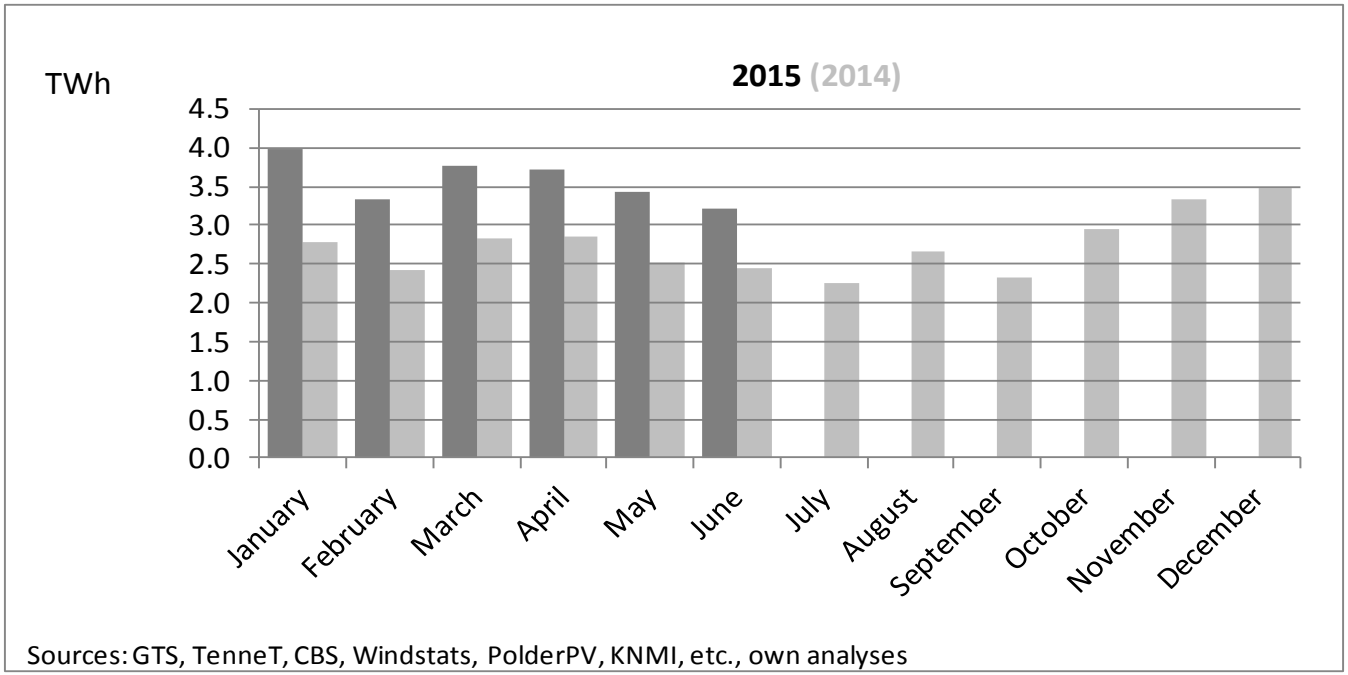

Sources: GTS, TenneT, CBS, Windstats, PolderPV, KNMI, etc., own analyses

For the six consecutive month, coal utilization for power generation increased significantly. In June, the average utilization rate of coal-fired power stations in the Netherlands is calculated to be 67%. This percentage includes maintenance.

Gas to Power
2015 (and 2014)

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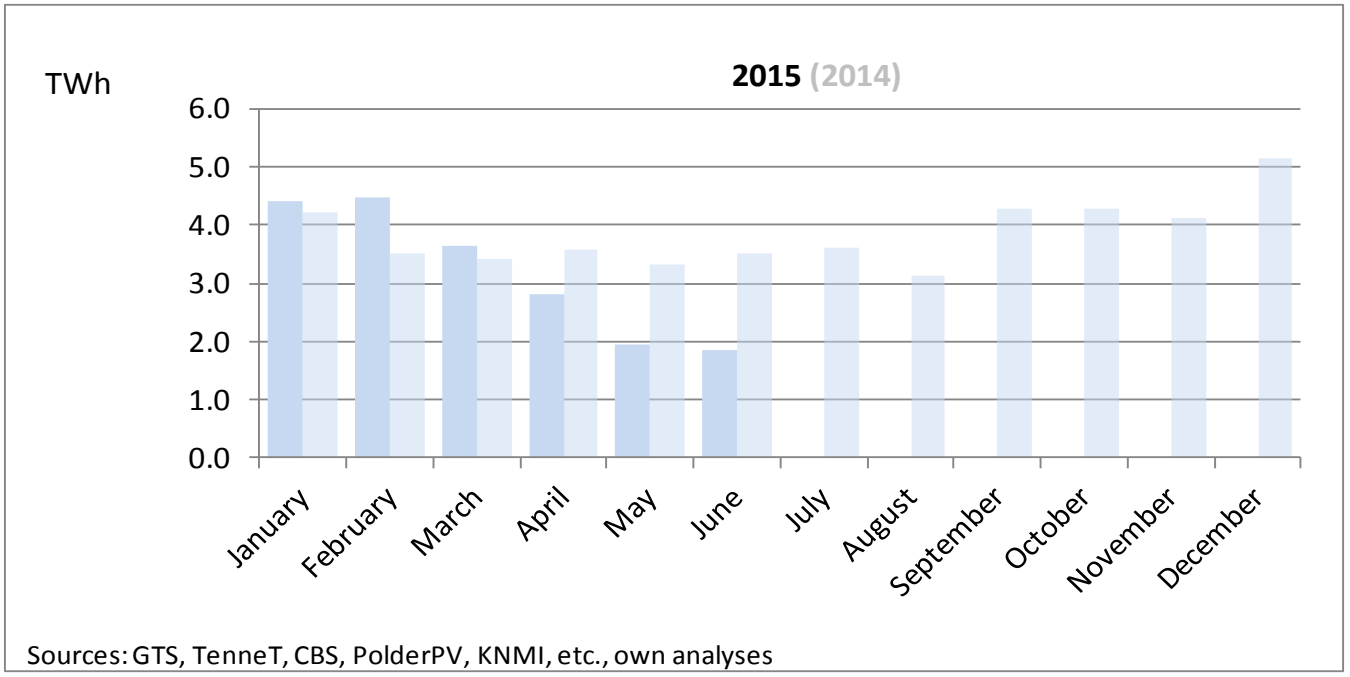
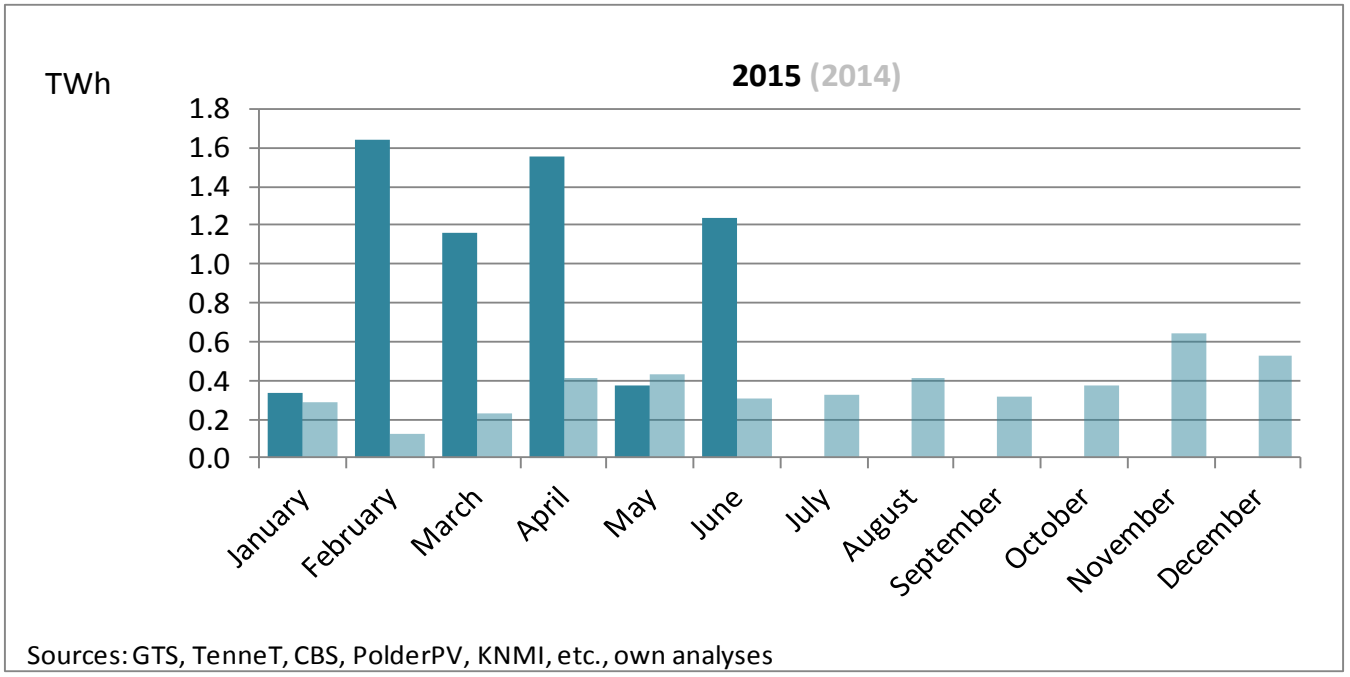


Sources: GTS, TenneT, CBS, PolderPV, KNMI, etc., own analyses

In June 2015, power production by gas-fired power stations and cogeneration was less than half compared to the same month in 2014. In June 2015, the average utilization rate of gas-fired capacity was just 19%. This number includes maintenance and mothballed installations.

LNG imports 2015 (and 2014)



Sources: GTS, TenneT, CBS, PolderPV, KNMI, etc., own analyses

In 2015, significantly more gas is imported via Gate terminal compared to 2014.

Renewable Energy
All Sources
2015 (and 2014)

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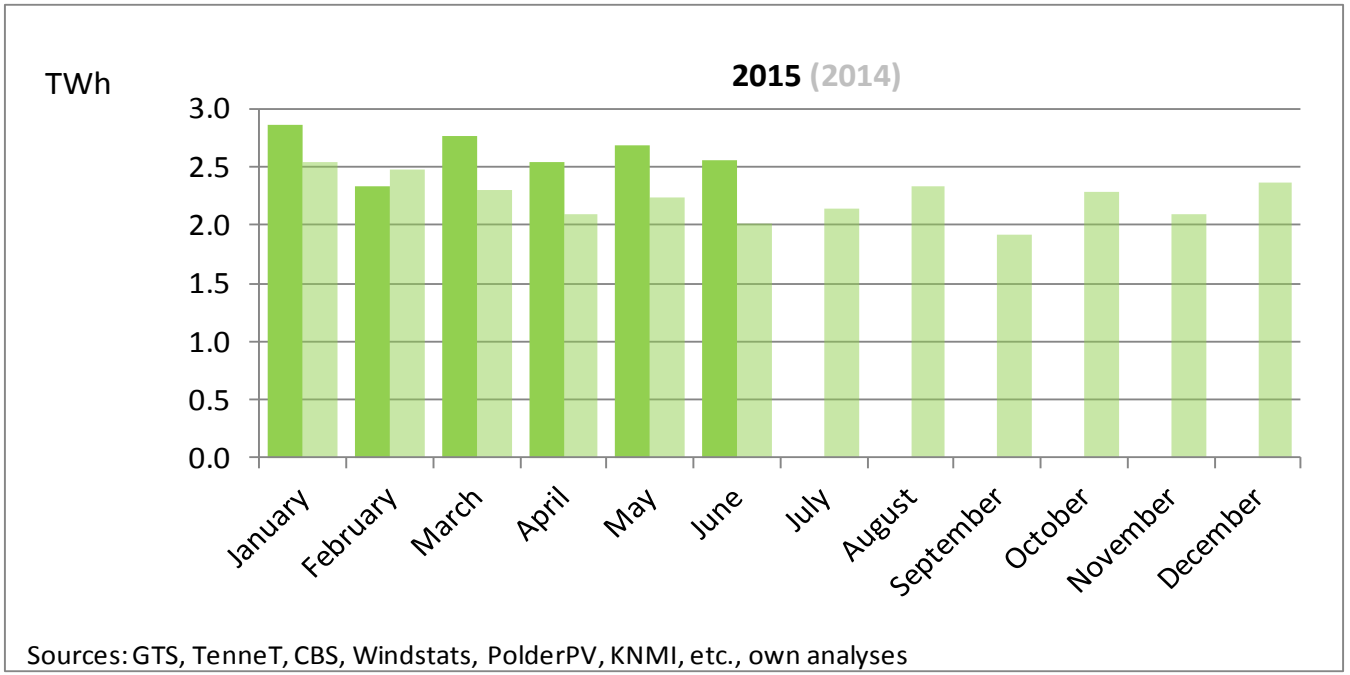

Sources: GTS, TenneT, CBS, Windstats, PolderPV, KNMI, etc., own analyses

In June, the Dutch National Statistical Office (CBS) released a report stating that the utilization of biomass ('wood') by households was significantly underestimated. Moreover, new (higher) data for the usage of bio-oil became available for 2014. The data for 2014 (and 2015) have been adjusted using this new information.

Renewable Energy Percentage 2015 (and 2014)

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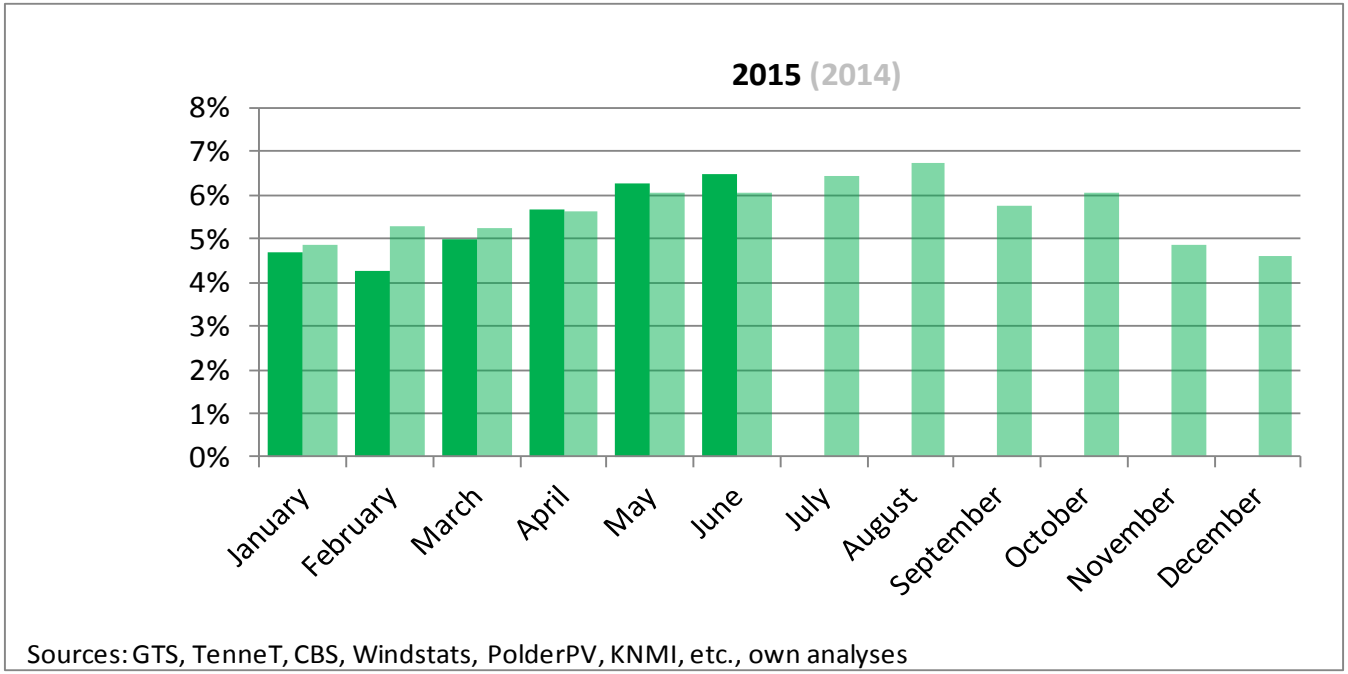

Sources: GTS, TenneT, CBS, Windstats, PolderPV, KNMI, etc., own analyses

The calculation of the percentage of renewable energy for The Netherlands, as fraction of final energy demand (EU definition), has been adjusted this month, taking into account the estimates of the Dutch Statistical Office about the usage of gas, coal and electricity for non-energy purposes. The effect is a 10% (relative) higher estimate for the percentage of renewable energy.

CO2 Emissions 2015 (and 2014)

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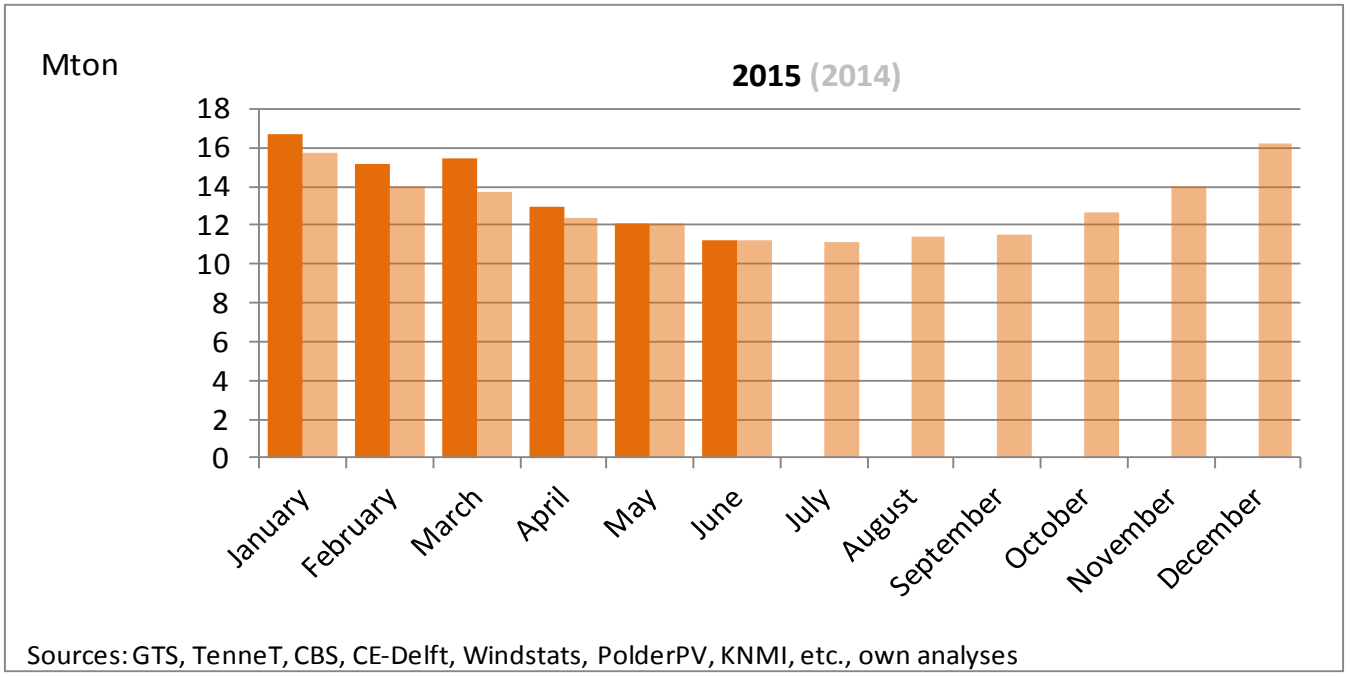
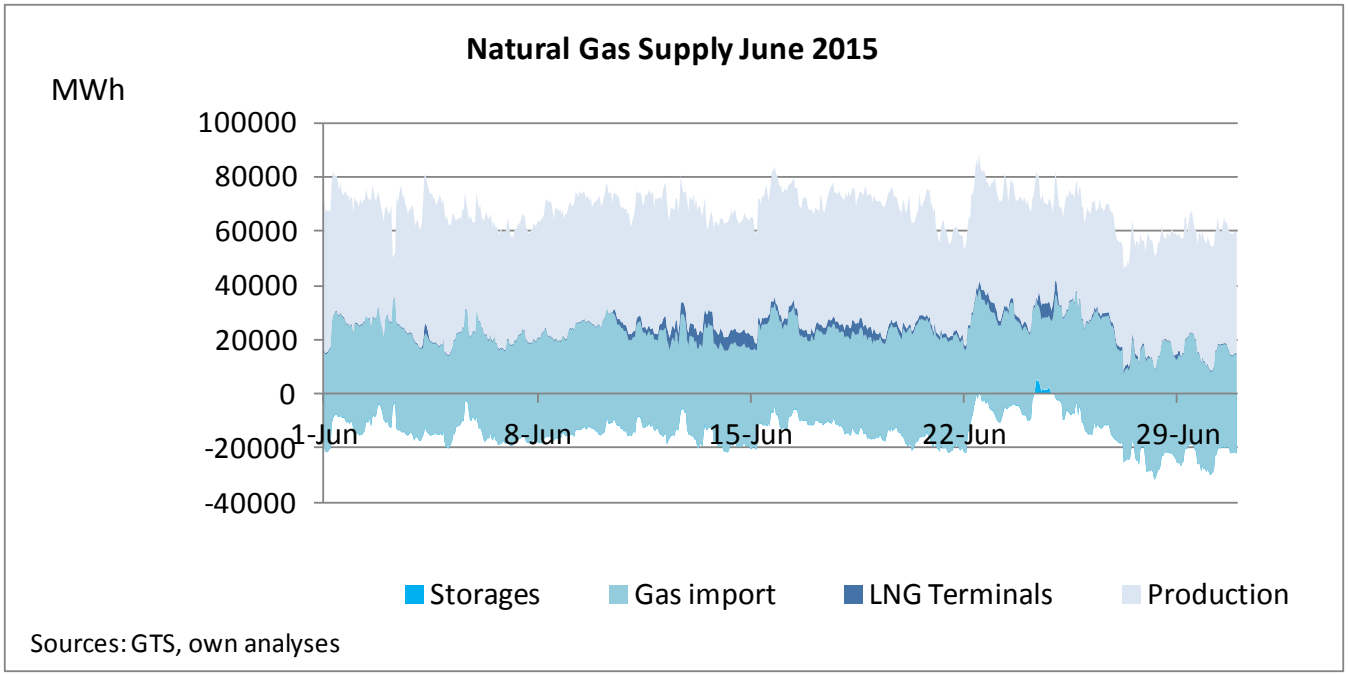


Sources: GTS, TenneT, CBS, CE-Delft, Windstats, PolderPV, KNMI, etc., own analyses

In June 2015, Dutch national CO2 emissions were at the same level as last year. The effects of larger amounts of renewables and more imported power has been compensated by a higher utilization of coal to generate power and lower ambient temperatures and thus, a higher gas demand.

SELECTED HOURLY ENERGY DATA

Gas Supply June 2015



In June 2015, substantial gas volumes were used to fill gas storages, depicted as negative values in the figure. Maximum gas supplies (import + production) were more than 80.000 MW.

Gas Demand
Including Gas-to-Power
June 2015

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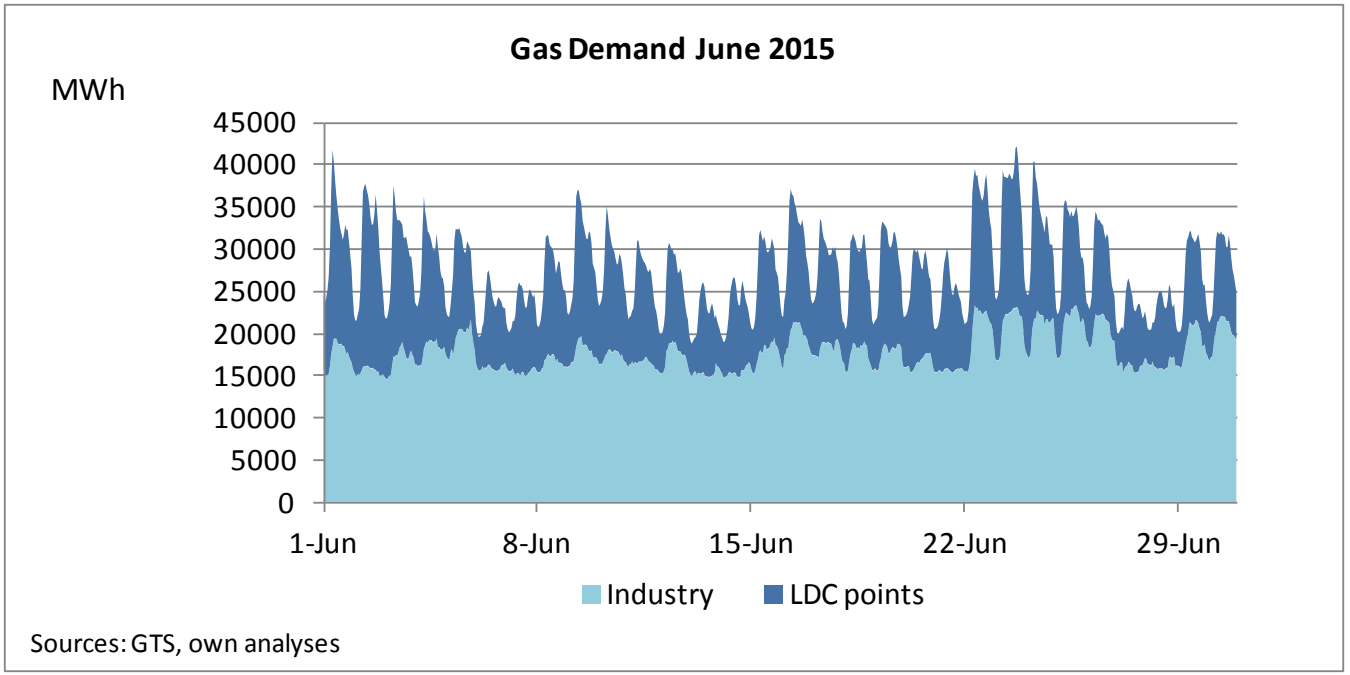

On June 24th, gas demand in The Netherlands peaked to more than 40.000 MW. Interesting to see that high gas demand in the week after June 22nd coincided with low levels of storage injection (previous sheet).

Gas Imports & Exports June 2015

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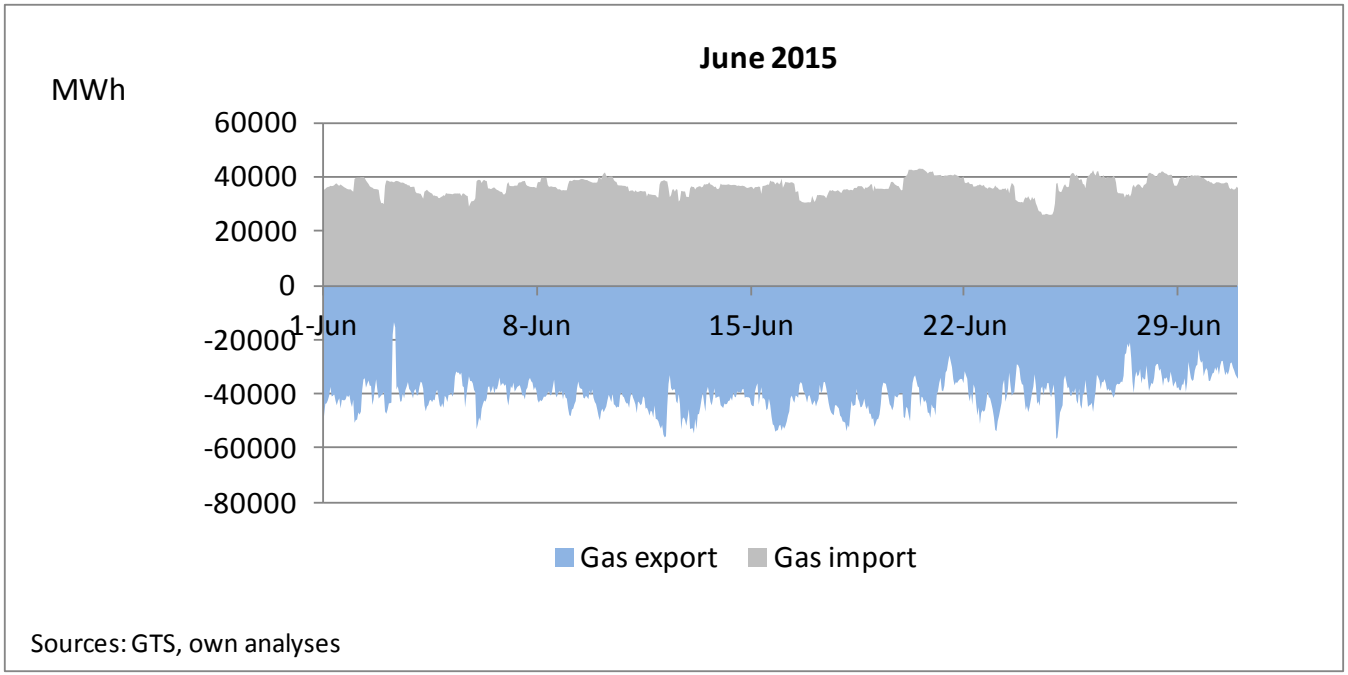
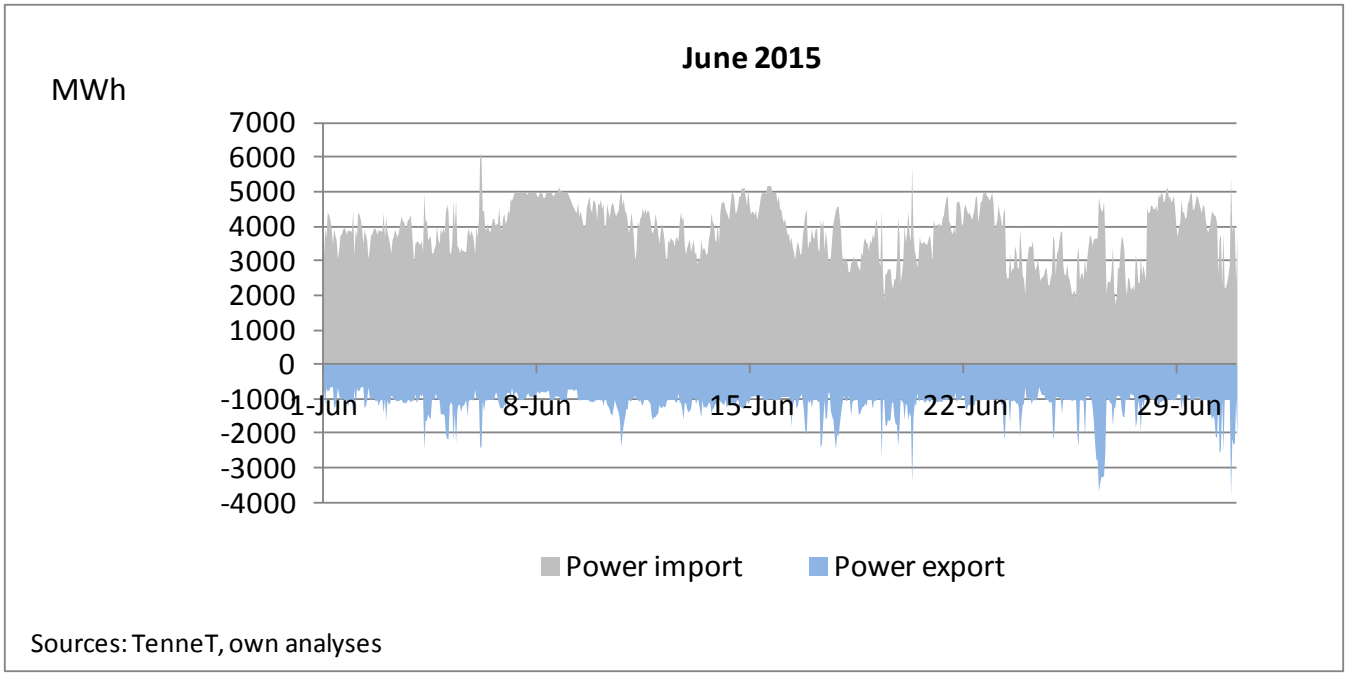


Sources: GTS, own analyses

In May 2015, Dutch imports were higher than exports. In June, the Netherlands became (again) a net exporting country. The level of gas imports and exports is about 40.000 MW.

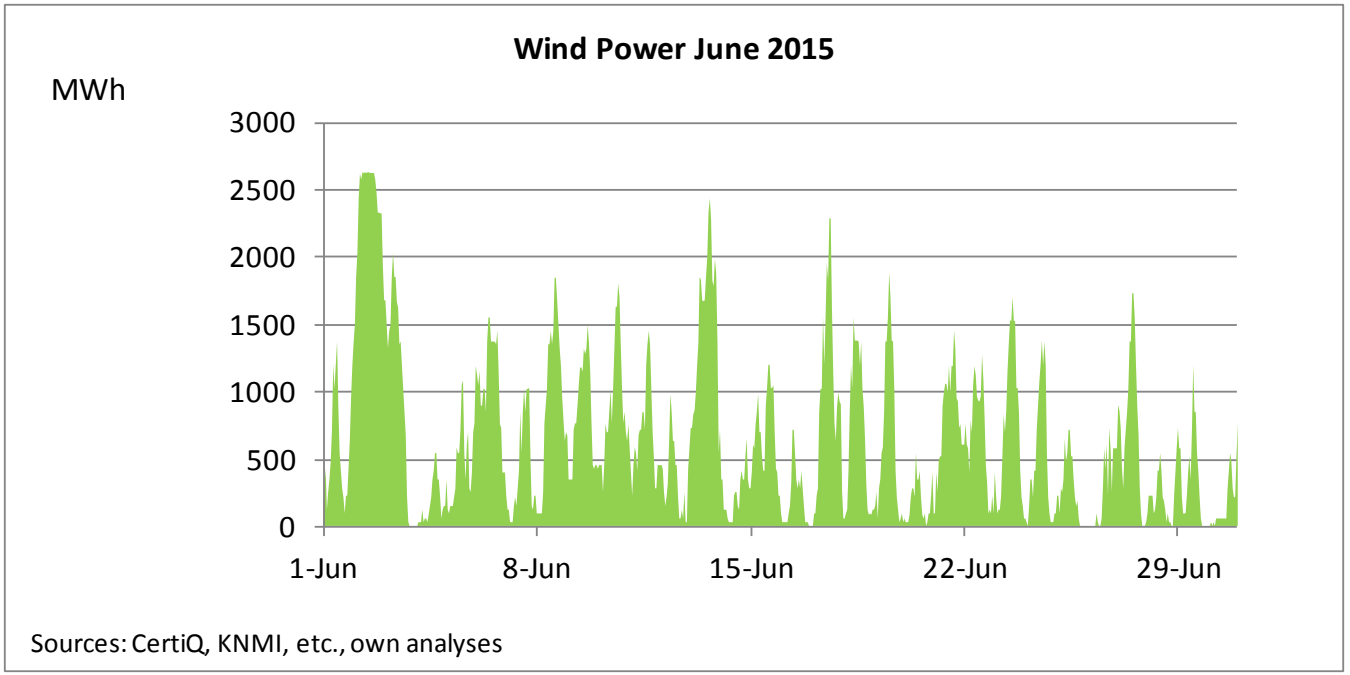
Power Imports & Exports May 2015



Sources: TenneT, own analyses

In June 2015, not much power exports were recorded while power imports soared compared to the first few months of 2015. Typically, the Netherlands imports about 4000 MW of power, while it exports about 1000 MW.

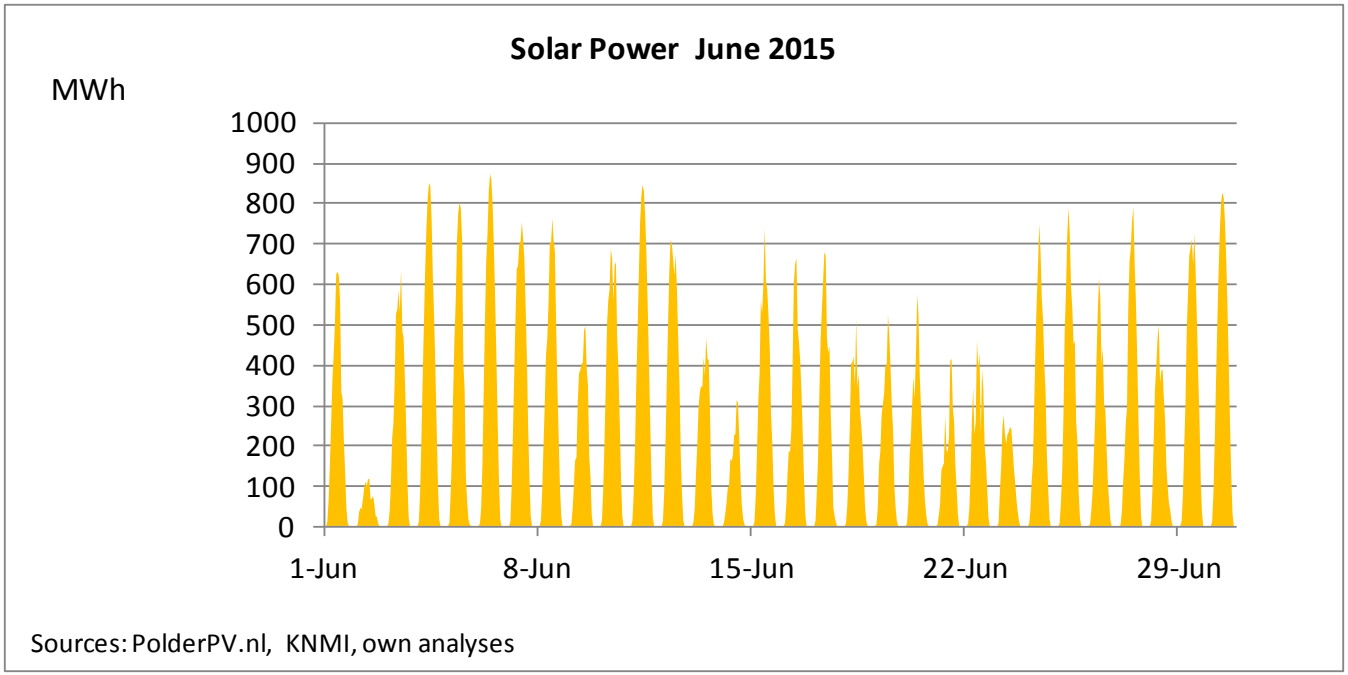
Wind Power June 2015



Sources: CertiQ, KNMI, etc., own analyses

In June 2015, the utilization rate of the available wind capacity was 21%. This percentage is significantly higher than last year.

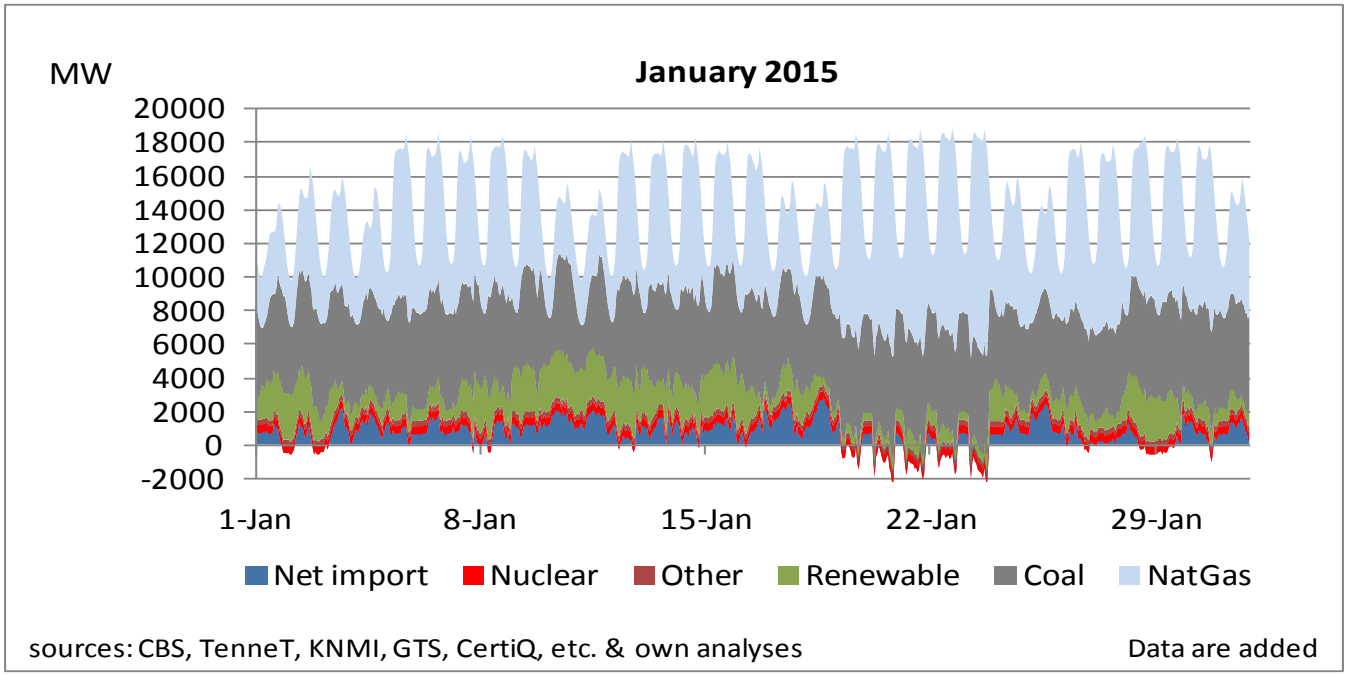
Solar PV Power June 2015



In June Solar-PV reached a new Dutch record level of 161 GWh. Solar-PV peaked to more than 800 MW on several days in the first half of June. In June, the average utilization rate of the solar PV installed was 18%.

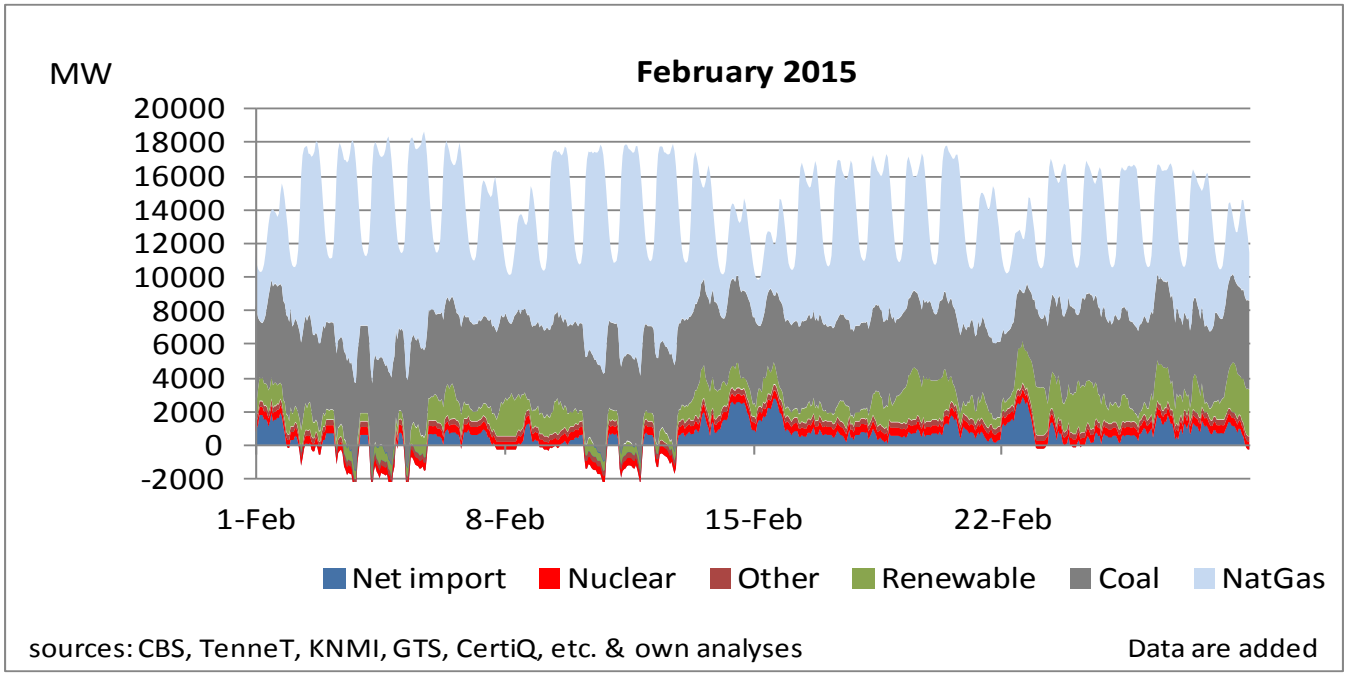
The following set of slides presents for each month in 2015 the hourly contributions of various energy sources to total power consumption in The Netherlands.

Power Generation January 2015



In the week of 20-24 January, power generation peaked, due to the net exports that occurred. The majority of the additional power generation has been generated by gas-fired installations.

Power Generation February 2015



Like in January, low wind availability coincided with net exports of power.

Power Generation March 2015

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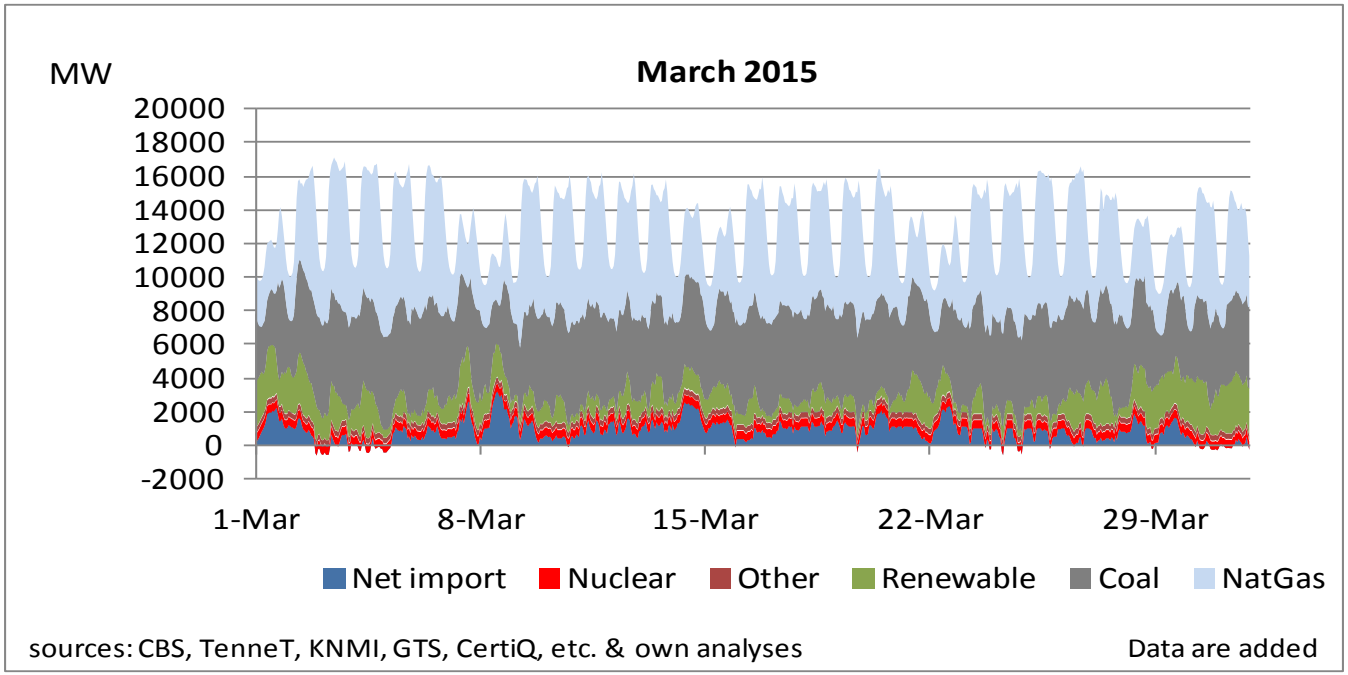

Relatively low imports of power occurred in March. On several Saturdays, some net exports were recorded.

Power Generation
April 2015

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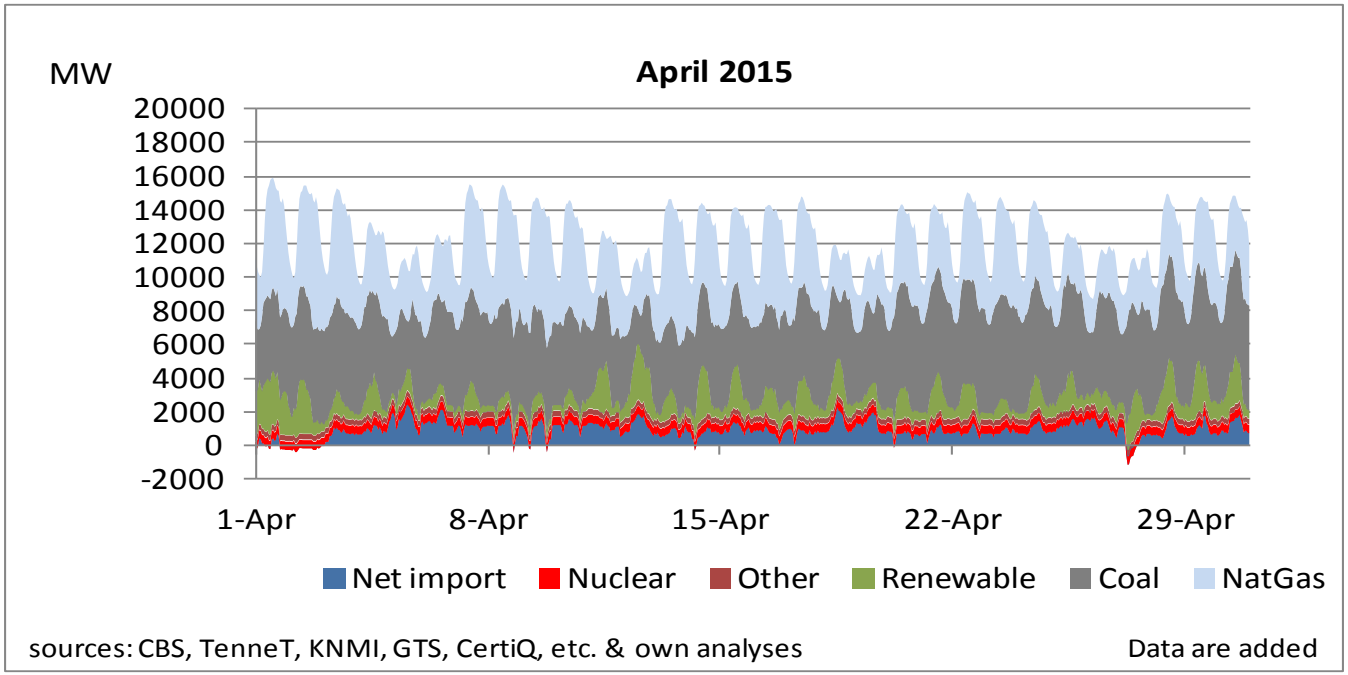
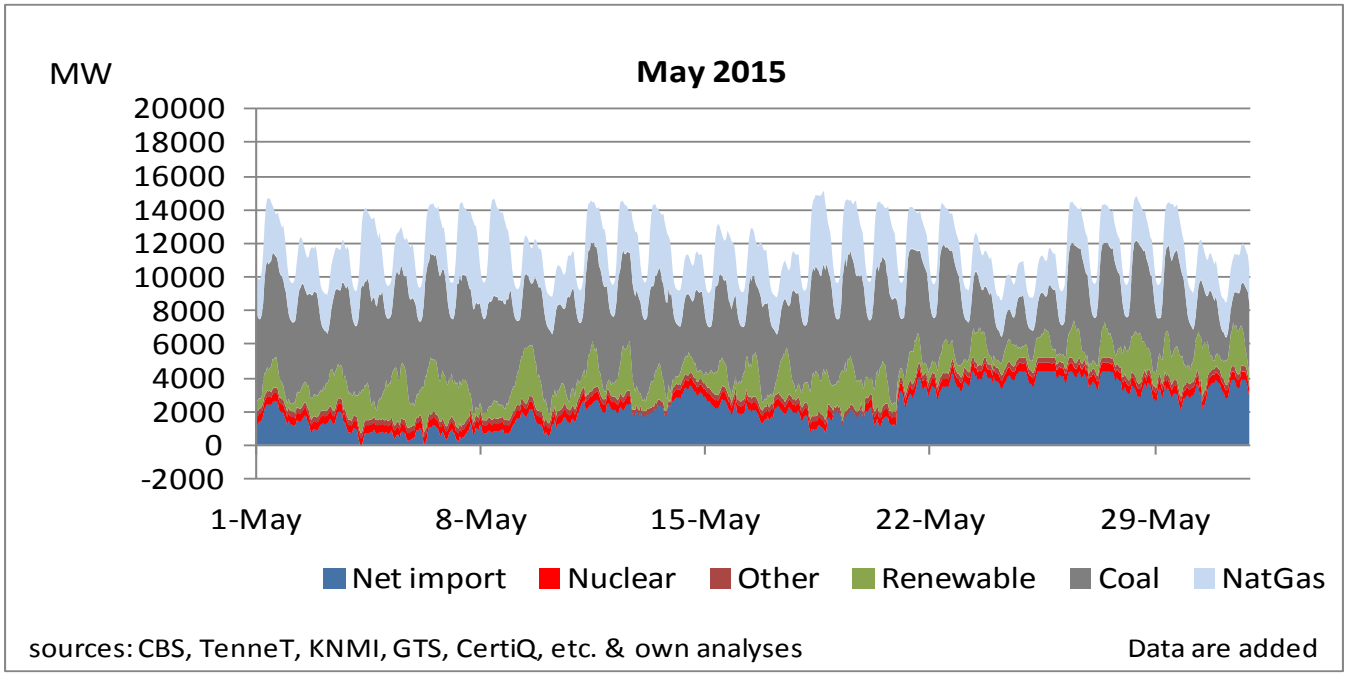


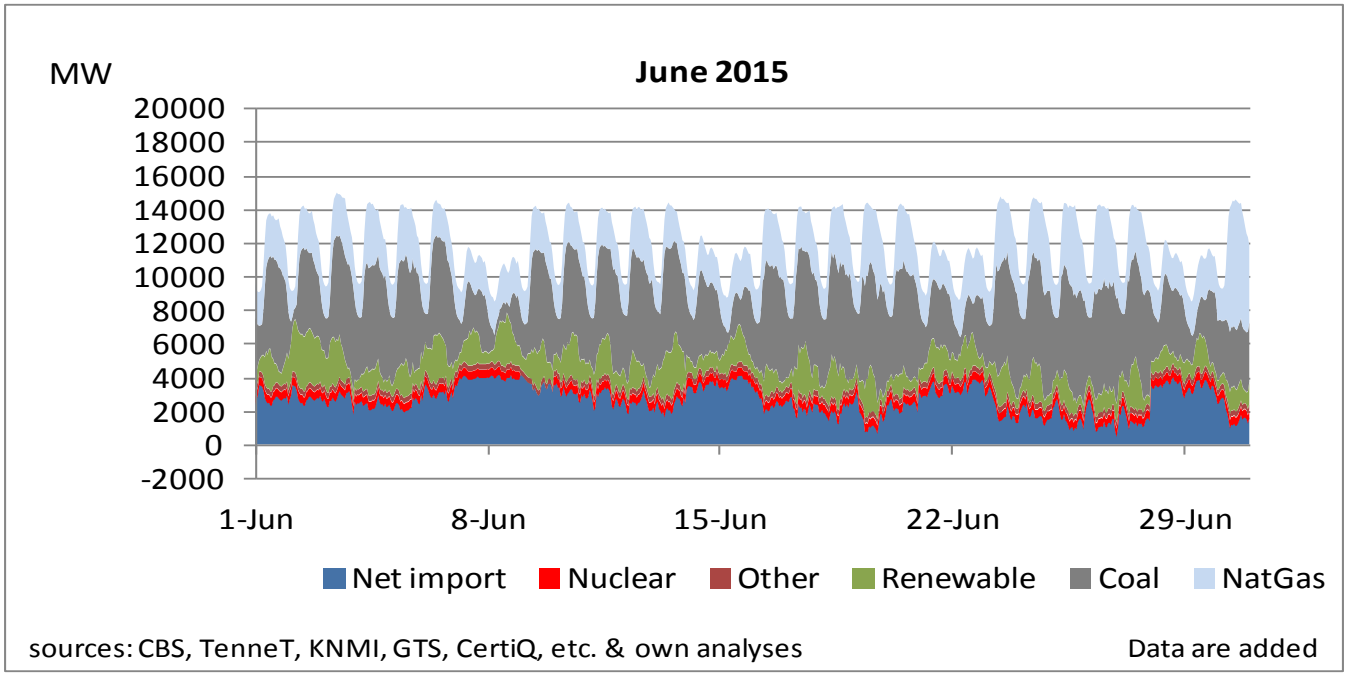
Relatively low imports of power occurred in April. On several occasions, mainly on Saturdays, net exports were recorded. April showed several days with high coal-fired generation, while gas-fired generation was low.

Power Generation May 2015



In May, high net imports and high coal utilization squeezed gas-fired power generation.

Power Generation
June 2015



In June, high net imports and high coal utilization squeezed out gas-fired power generation.

The following set of slides presents for each week in 2015 the hourly contributions of wind and solar-PV to the total power consumption in The Netherlands.

Hourly Solar-PV and Wind Generation 2015

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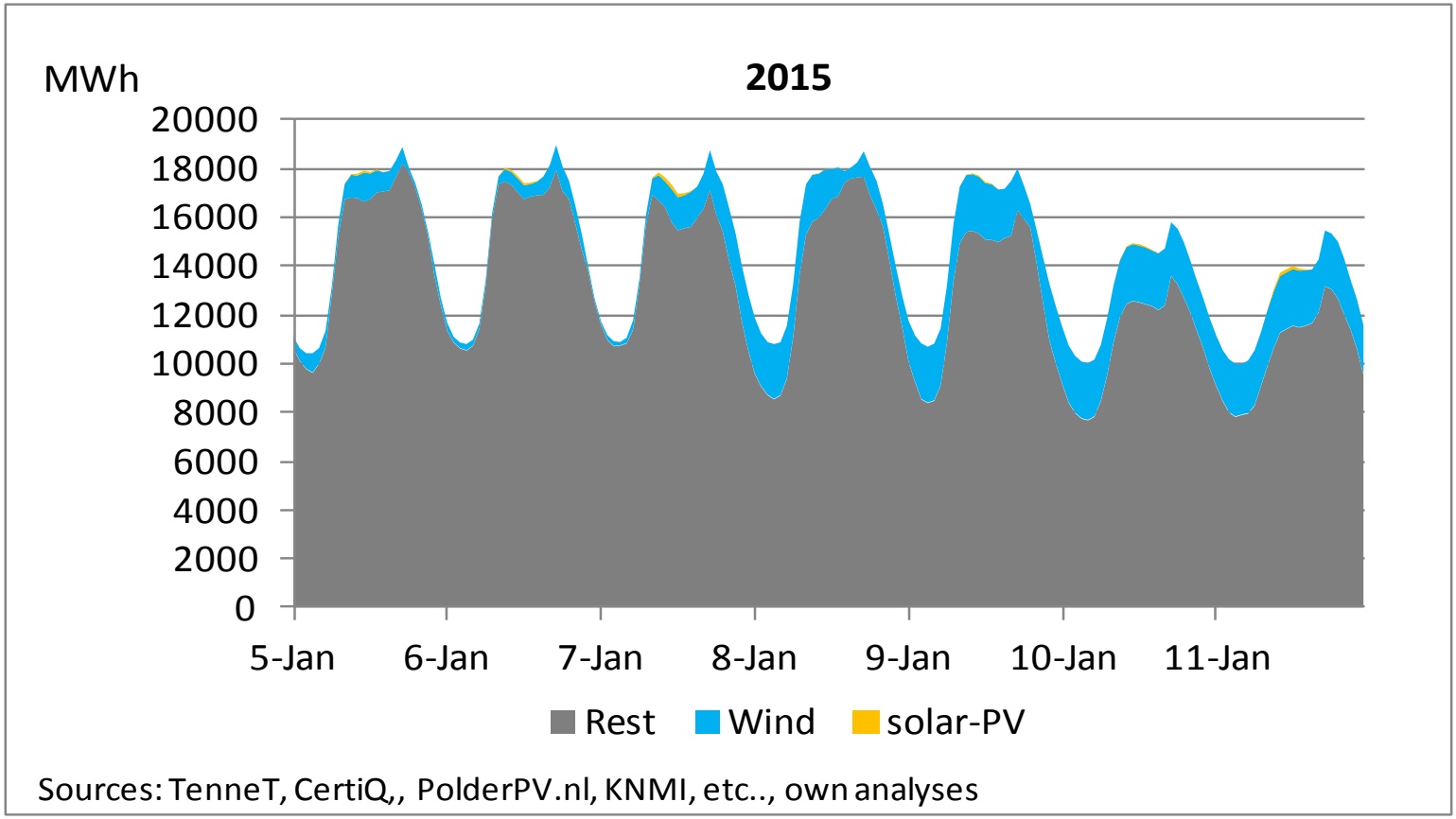

Sources: TenneT, CertiQ,, PolderPV.nl, KNMI, etc.., own analyses

Hourly Solar-PV and Wind Generation 2015

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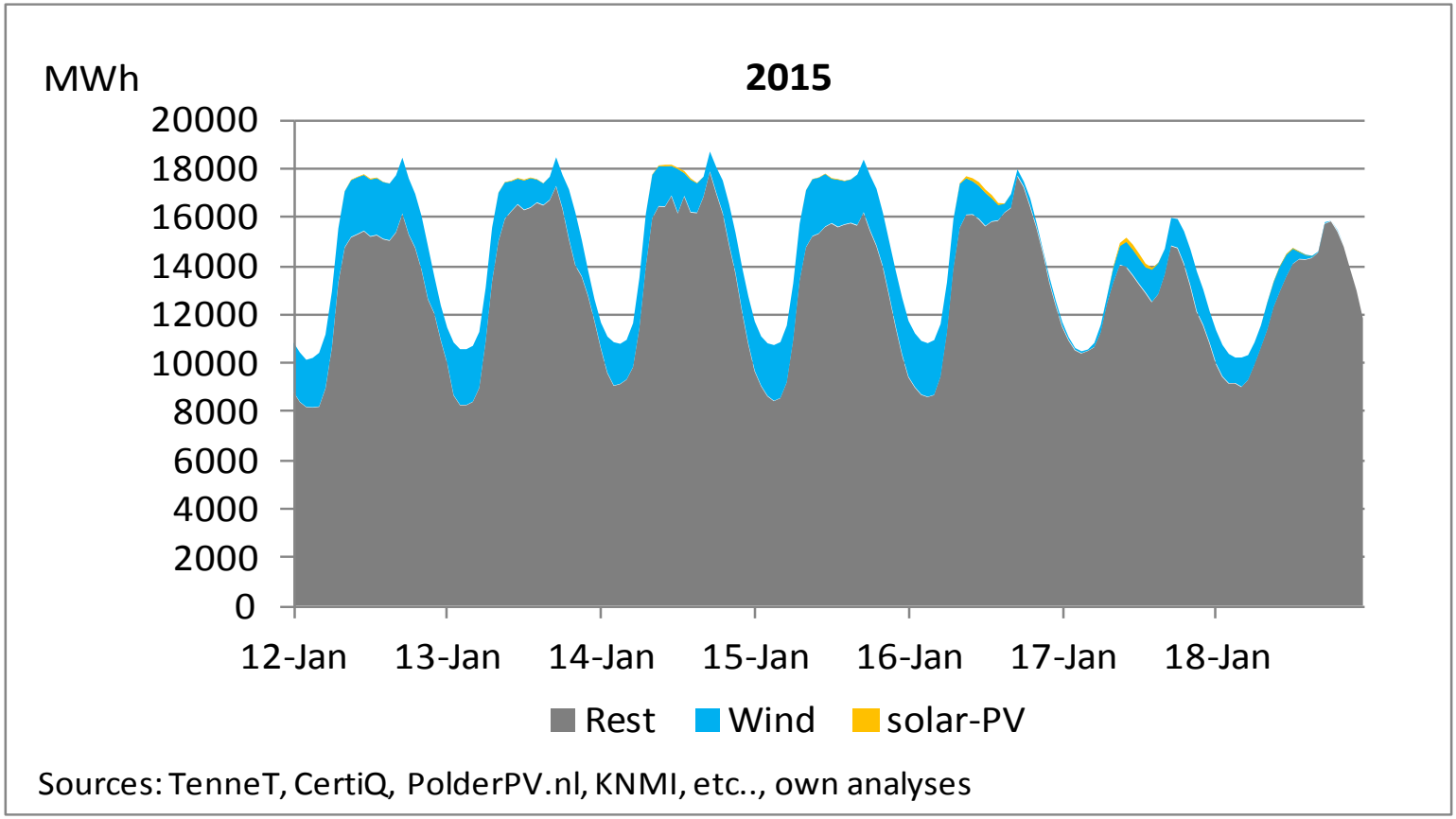

Sources: TenneT, CertiQ, PolderPV.nl, KNMI, etc.., own analyses

Hourly Solar-PV and Wind Generation 2015

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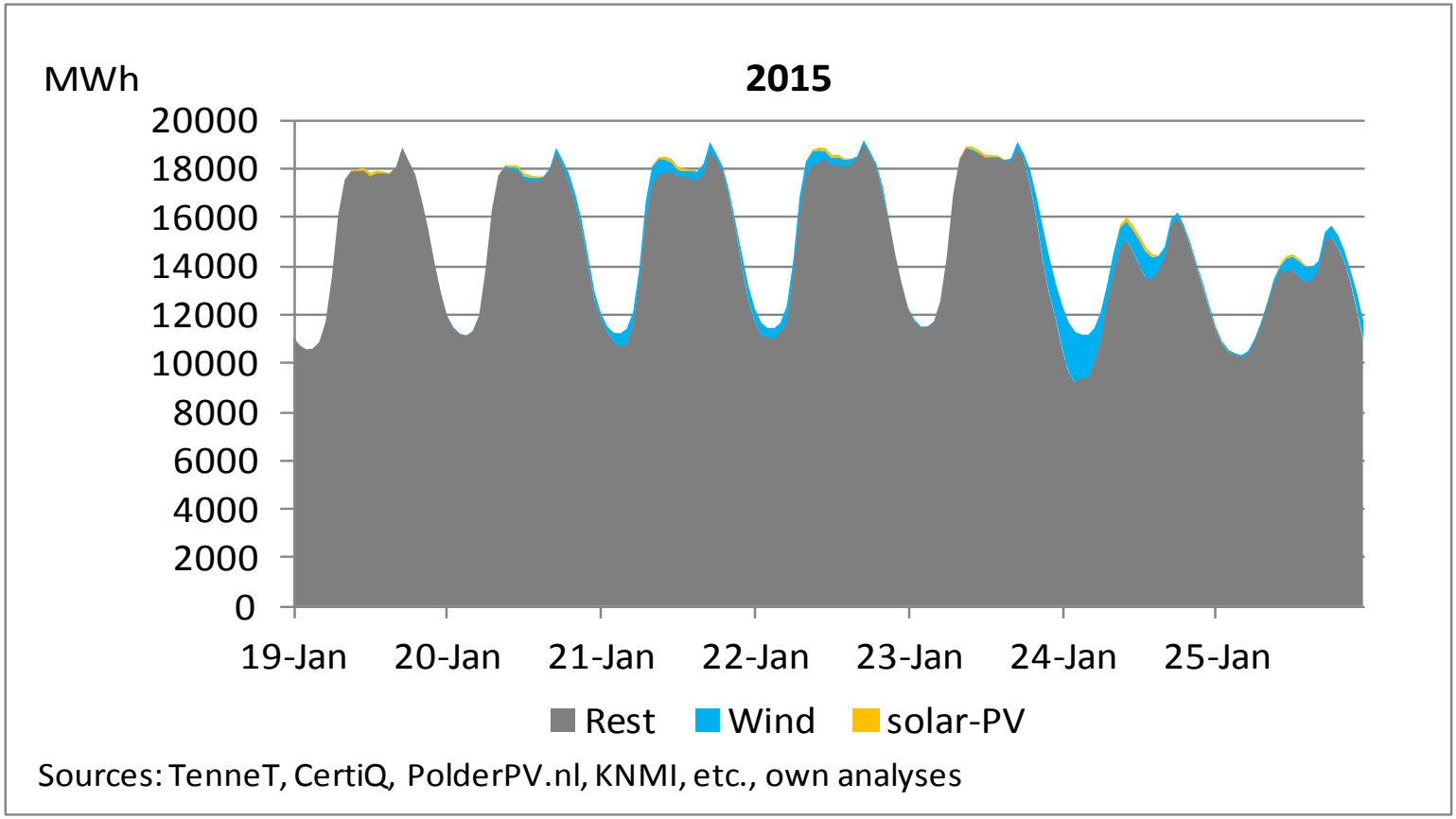

Sources: TenneT, CertiQ, PolderPV.nl, KNMI, etc., own analyses

Hourly Solar-PV and Wind Generation 2015

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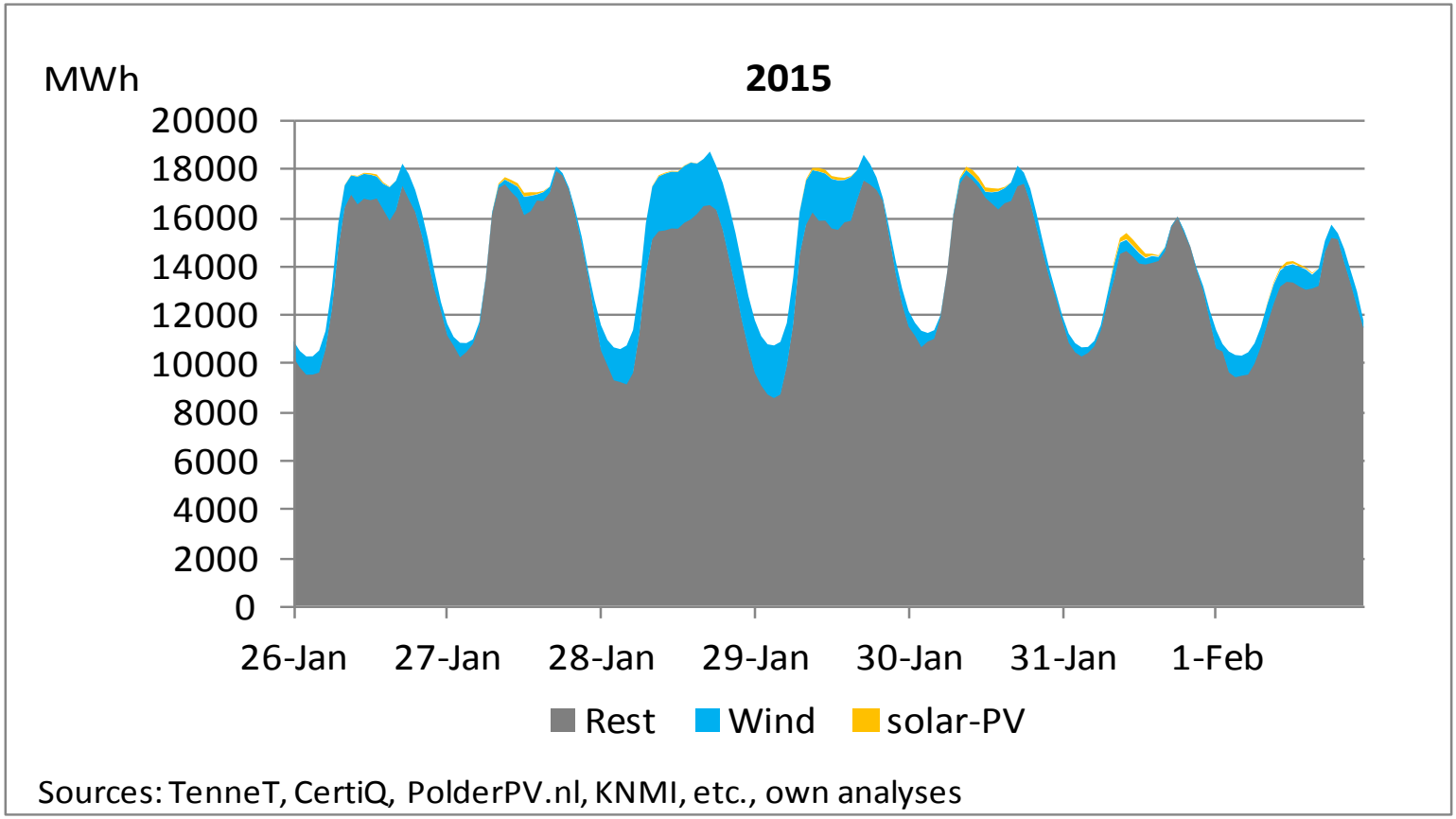

Sources: TenneT, CertiQ, PolderPV.nl, KNMI, etc., own analyses

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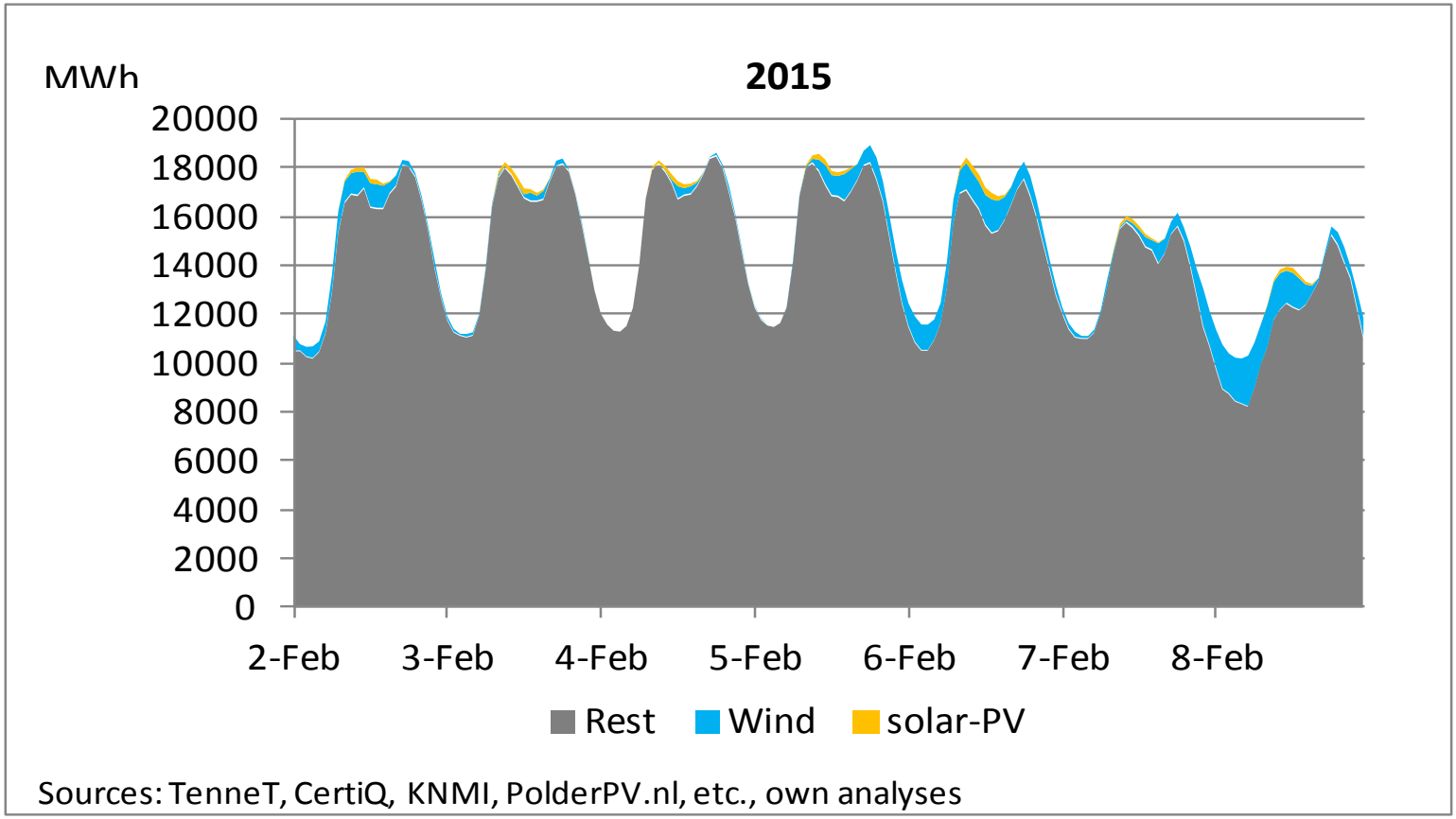

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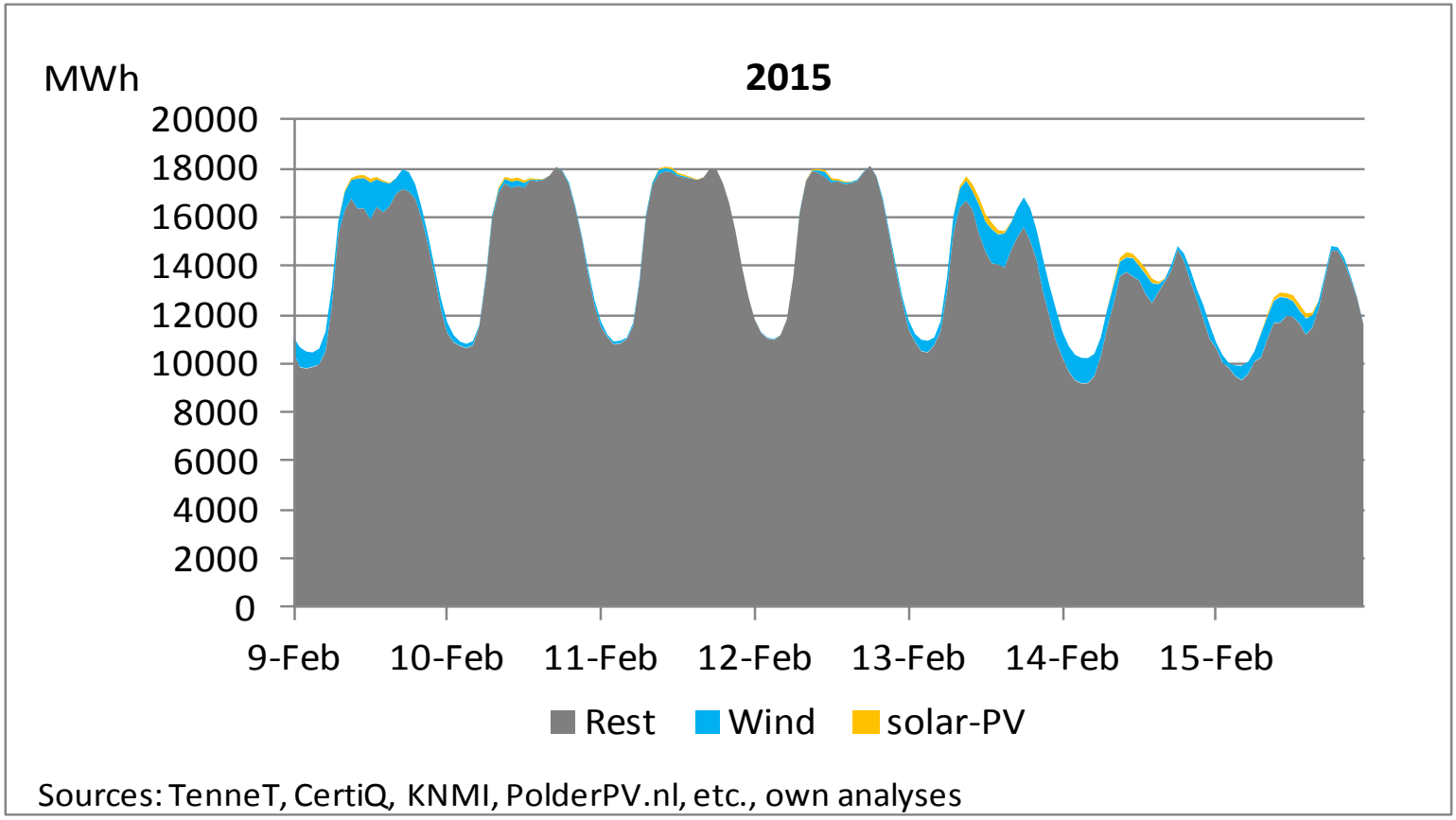

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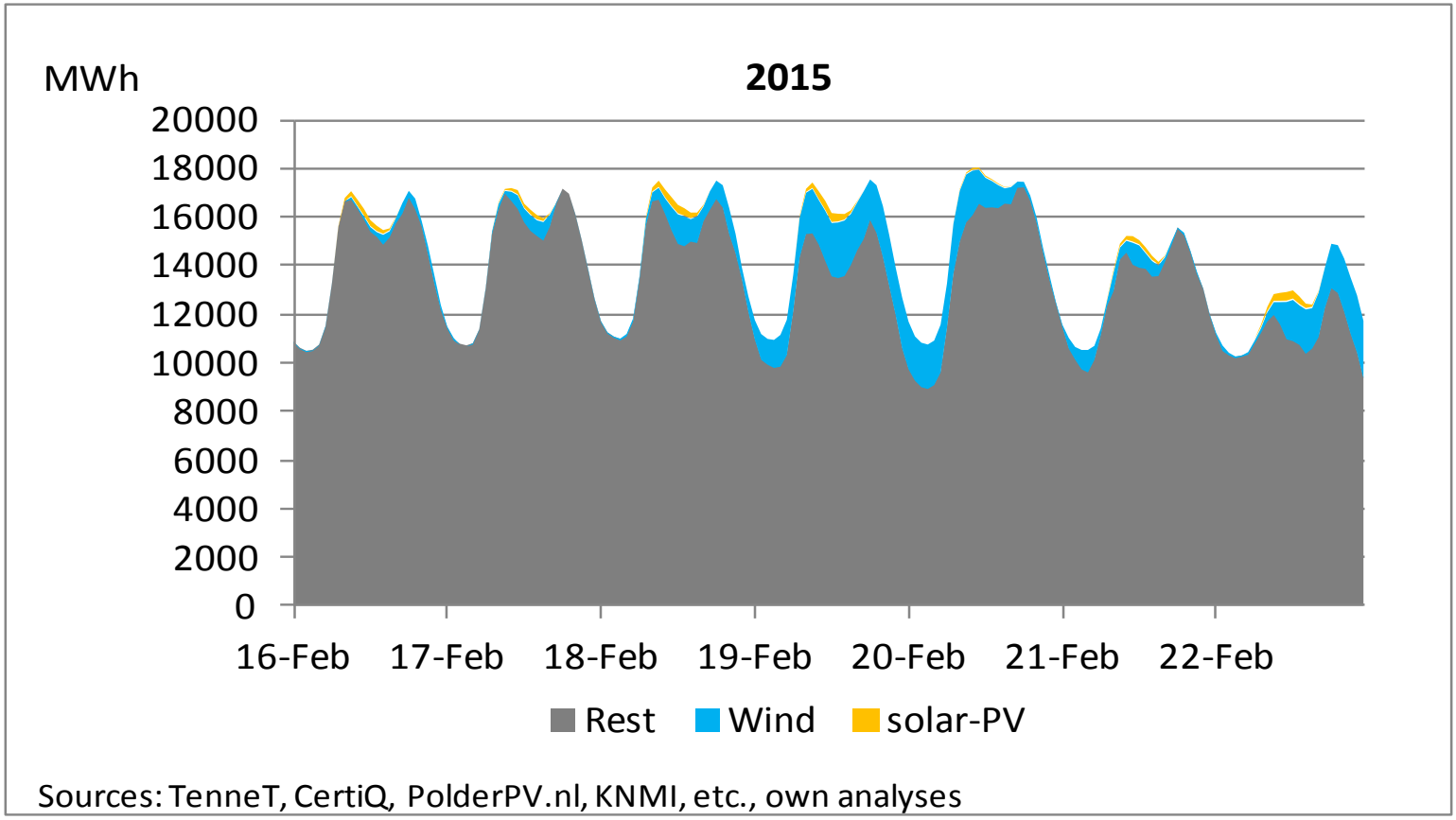

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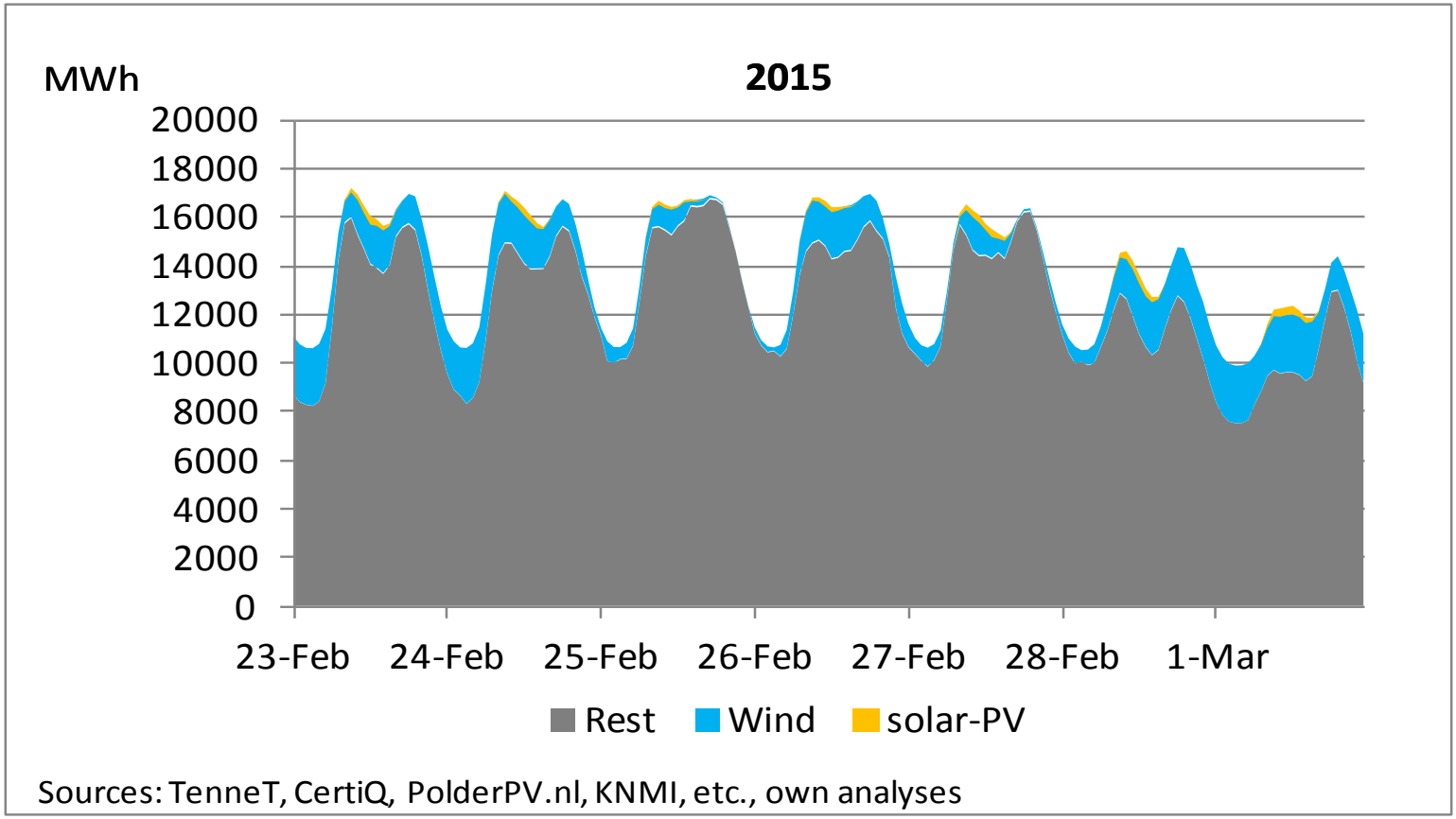

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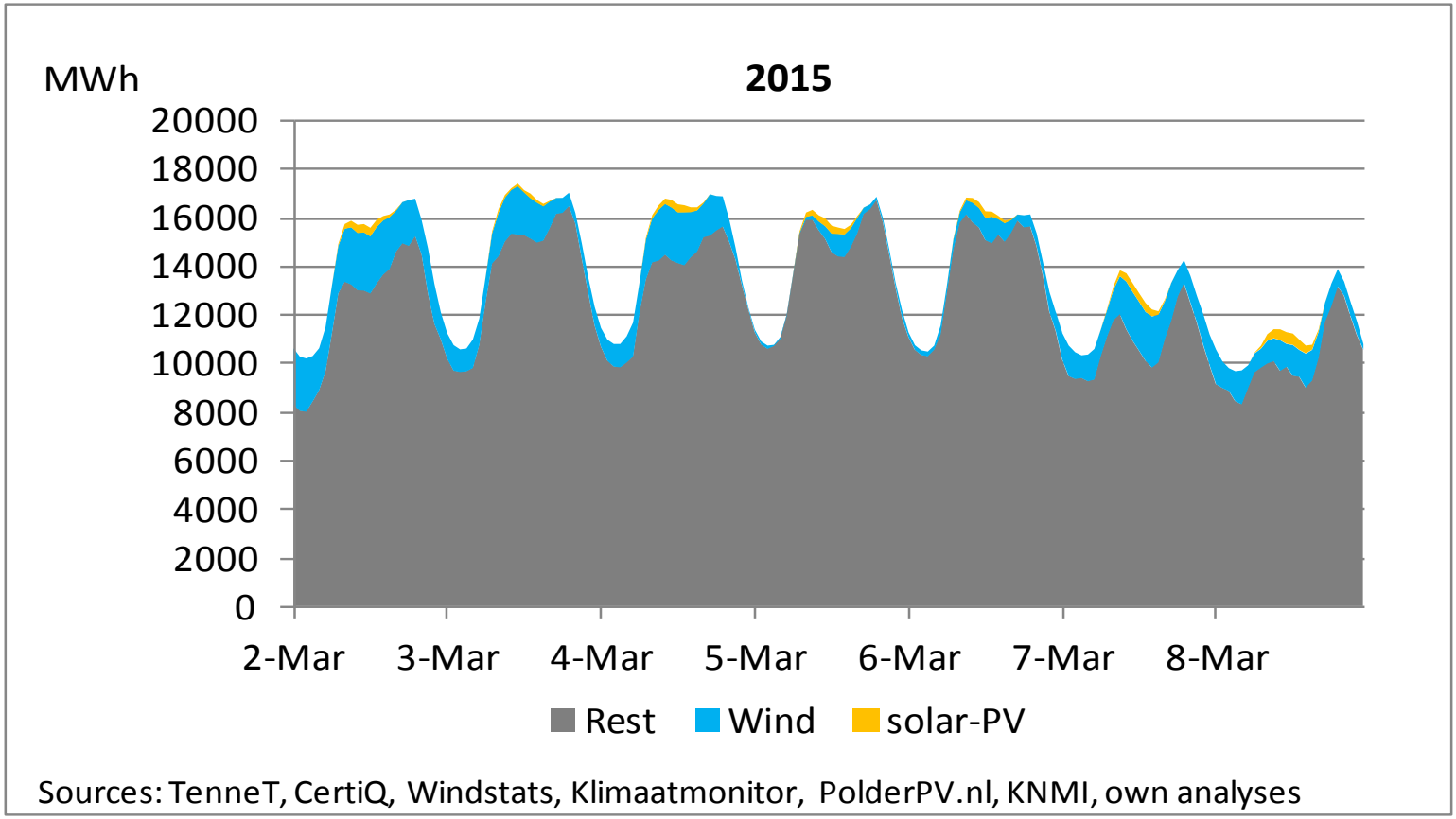

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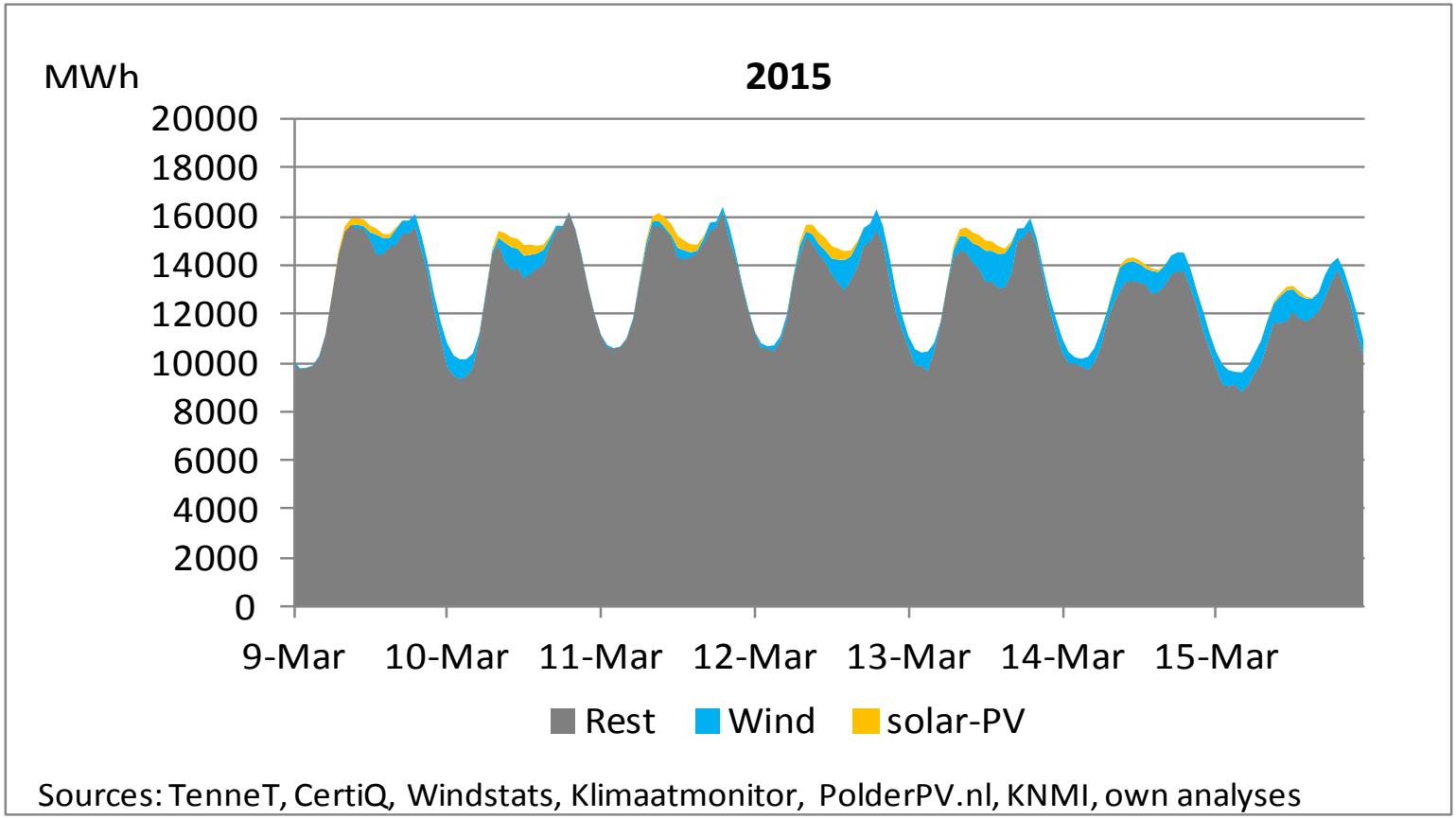

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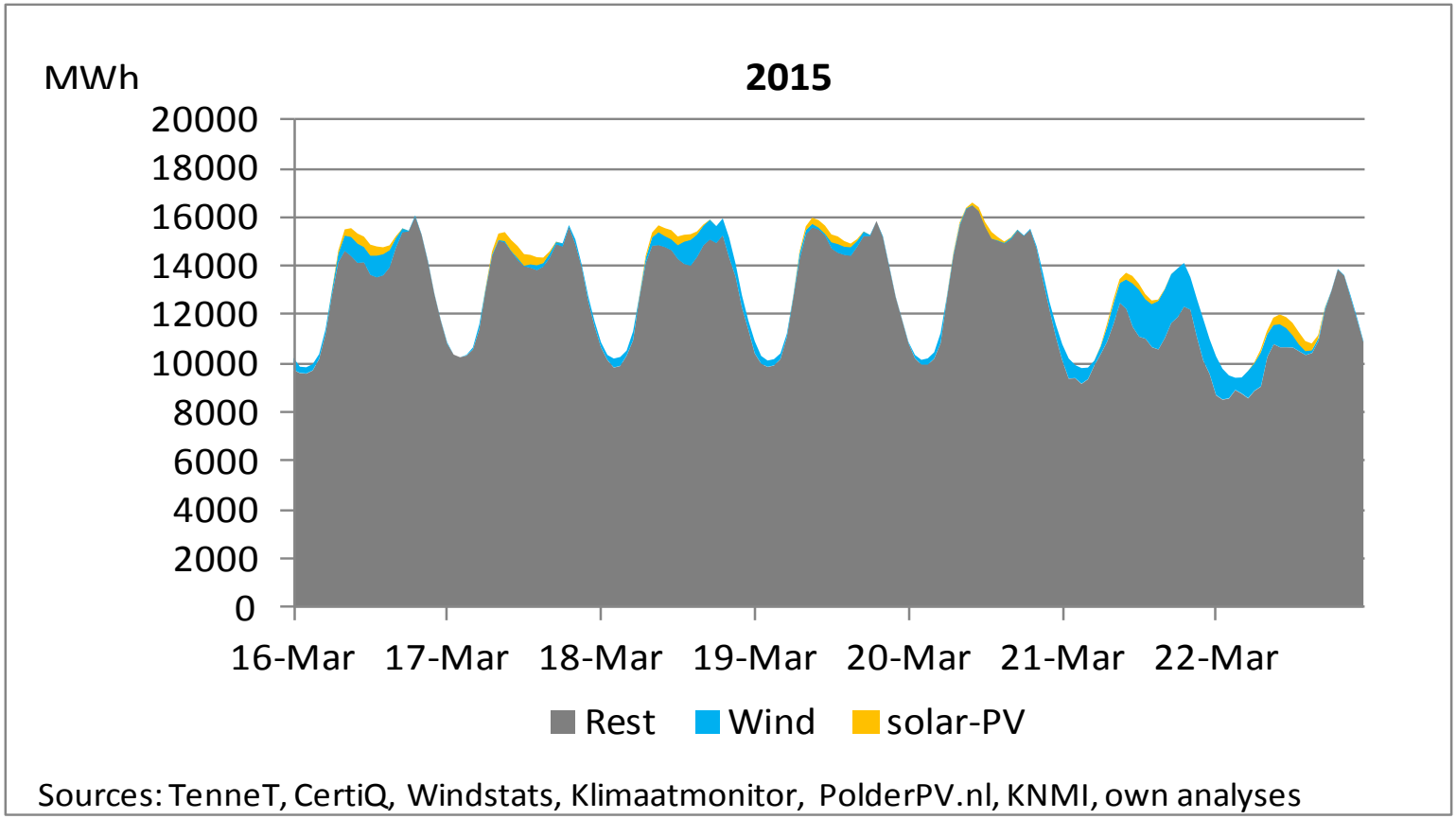

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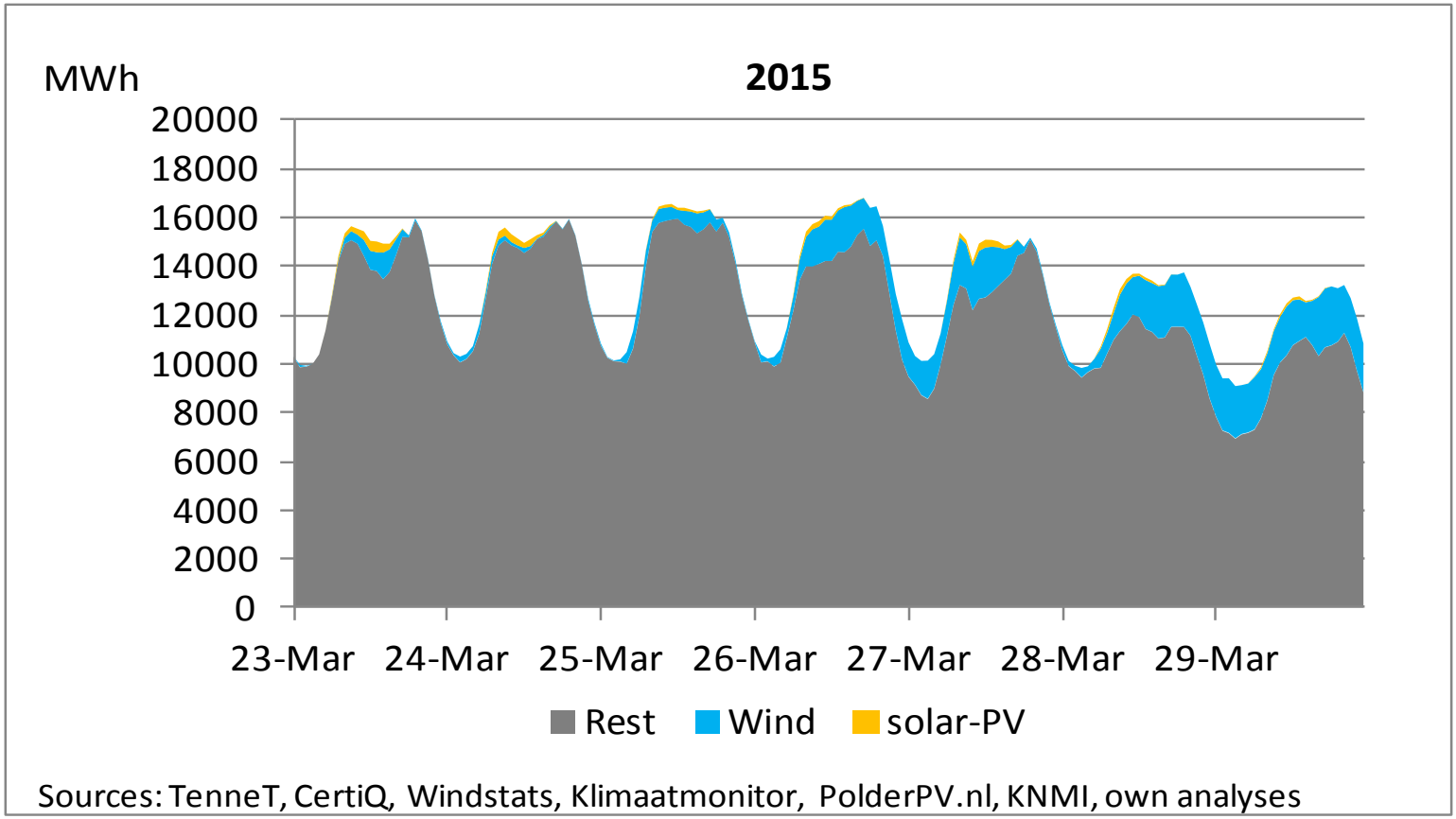

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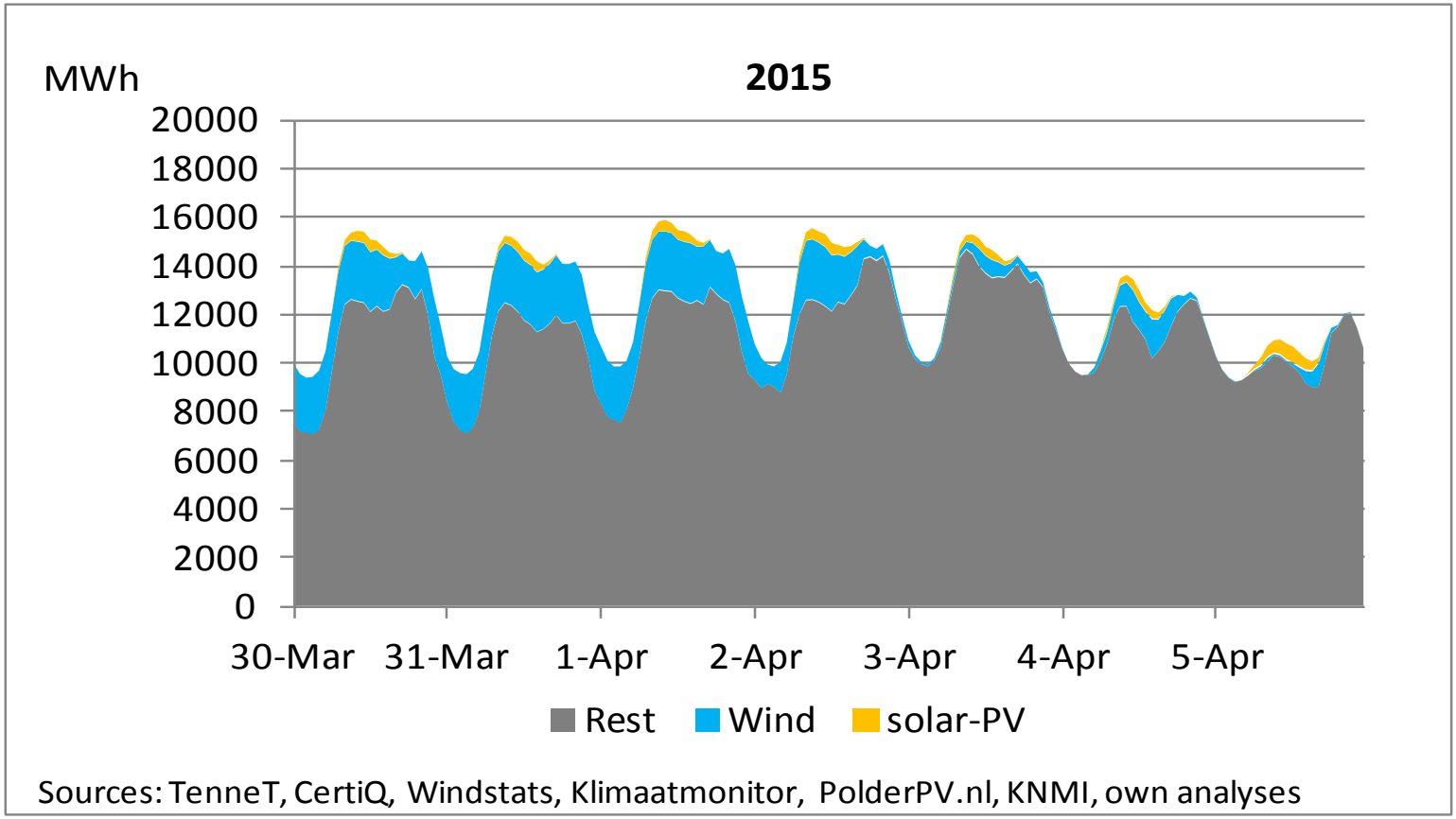

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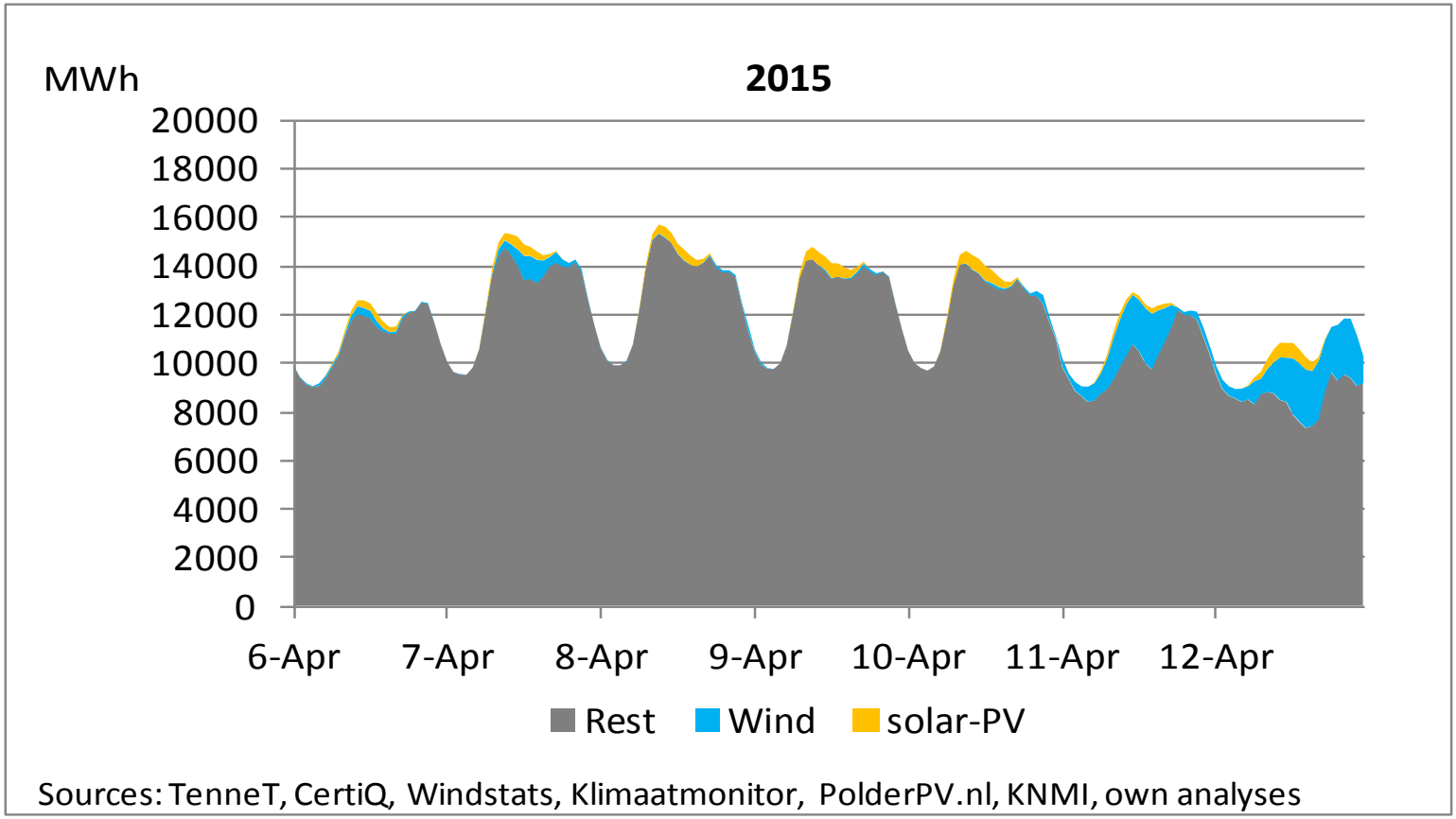

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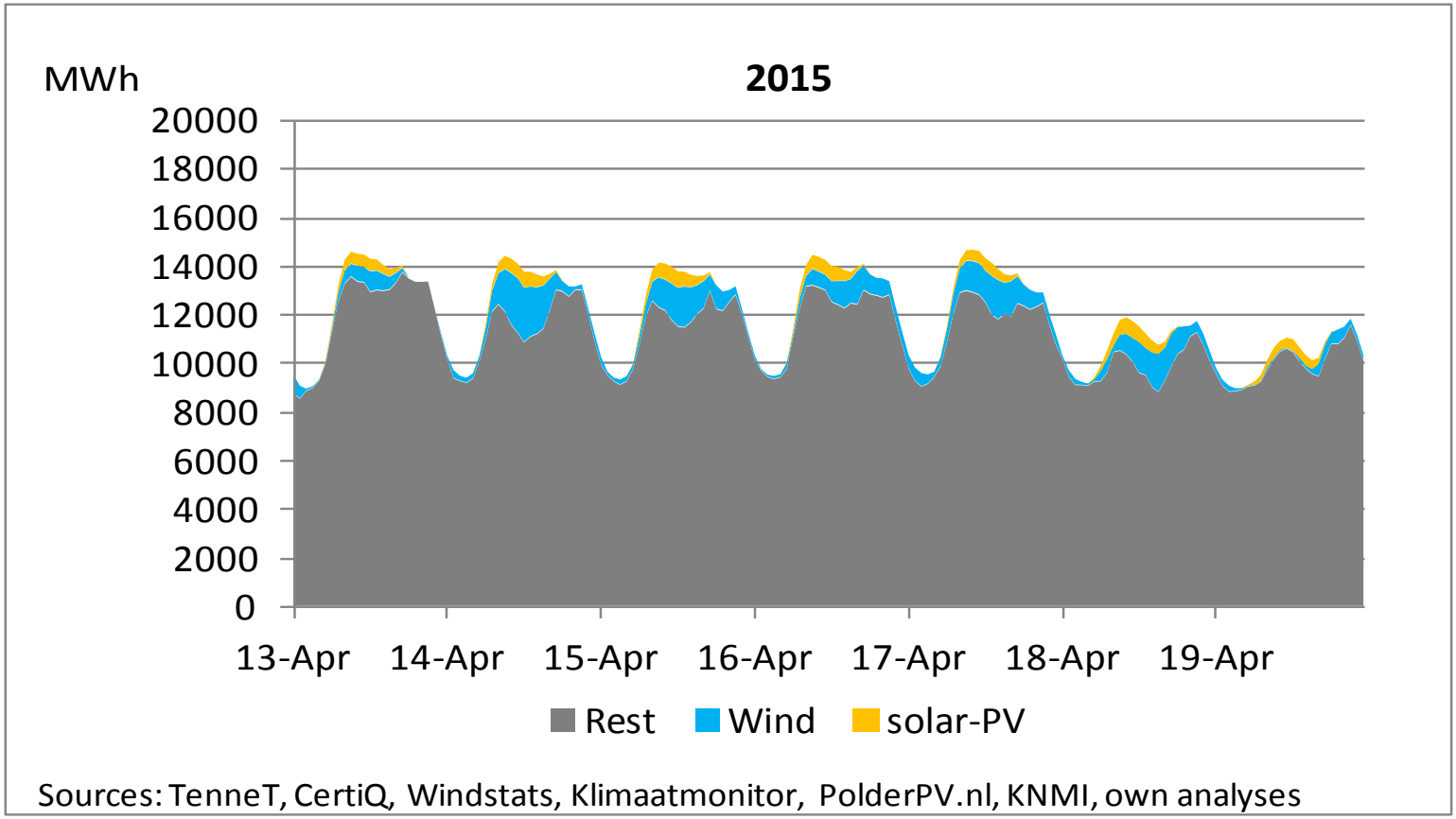

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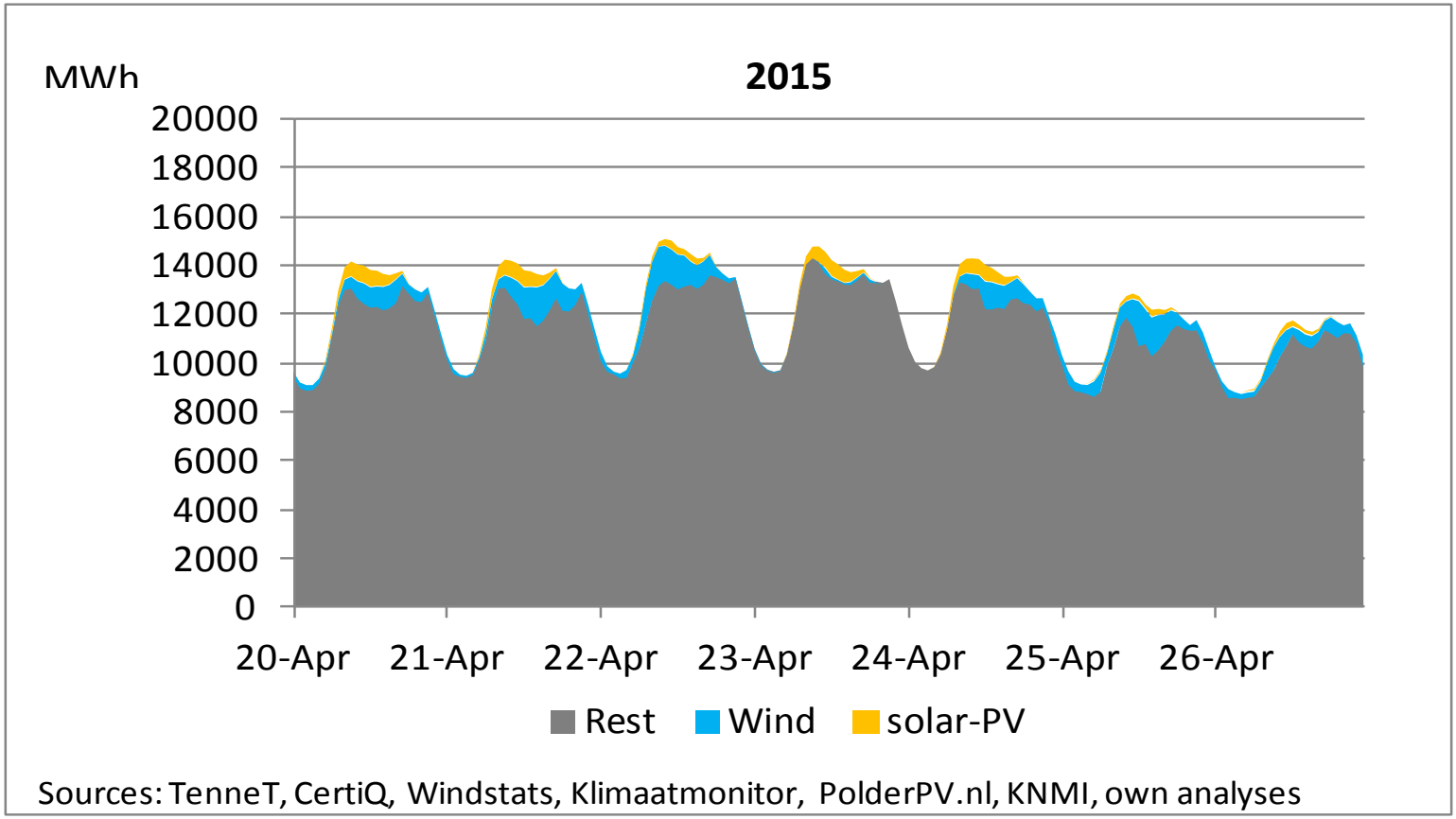

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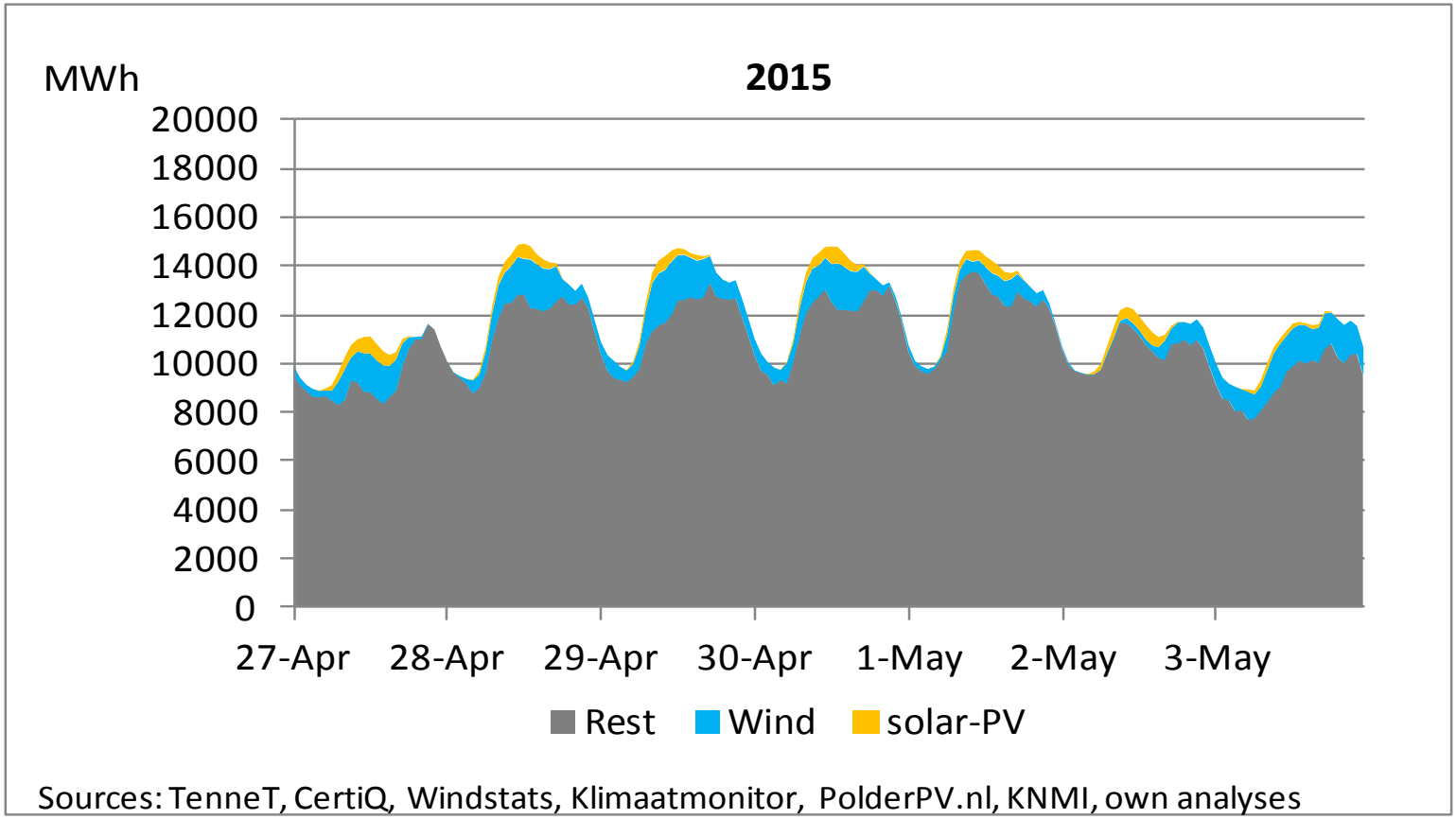

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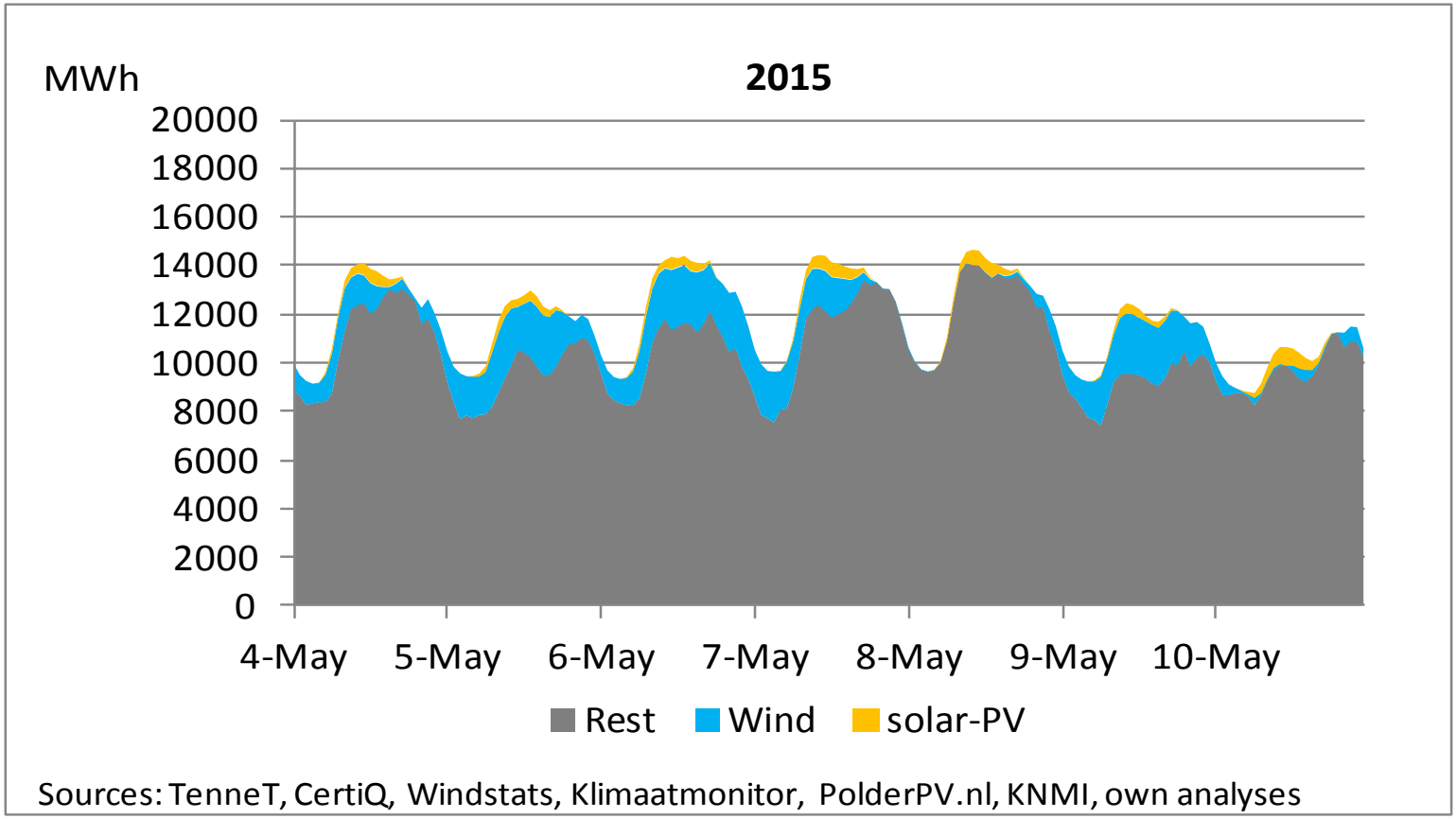

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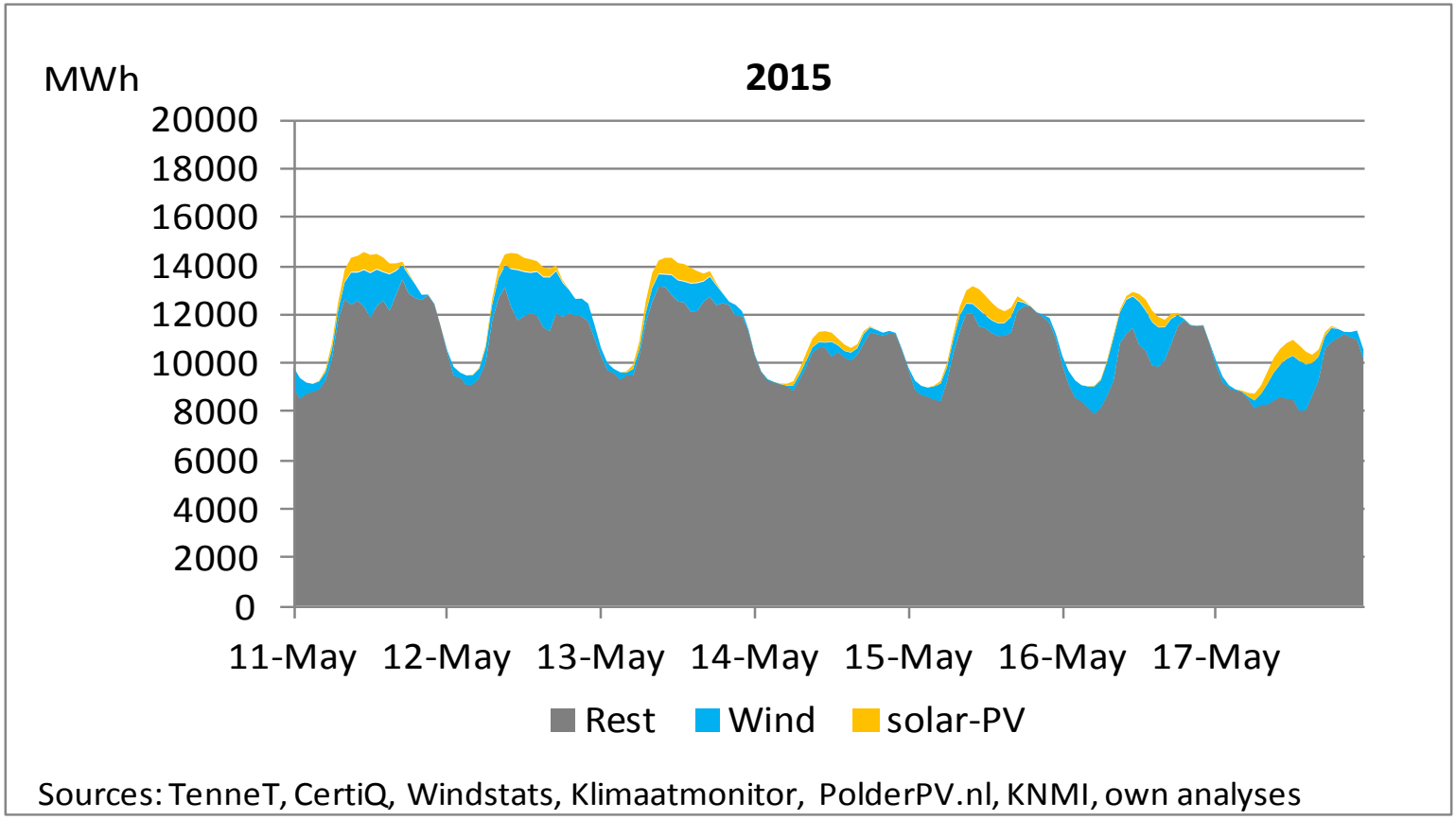

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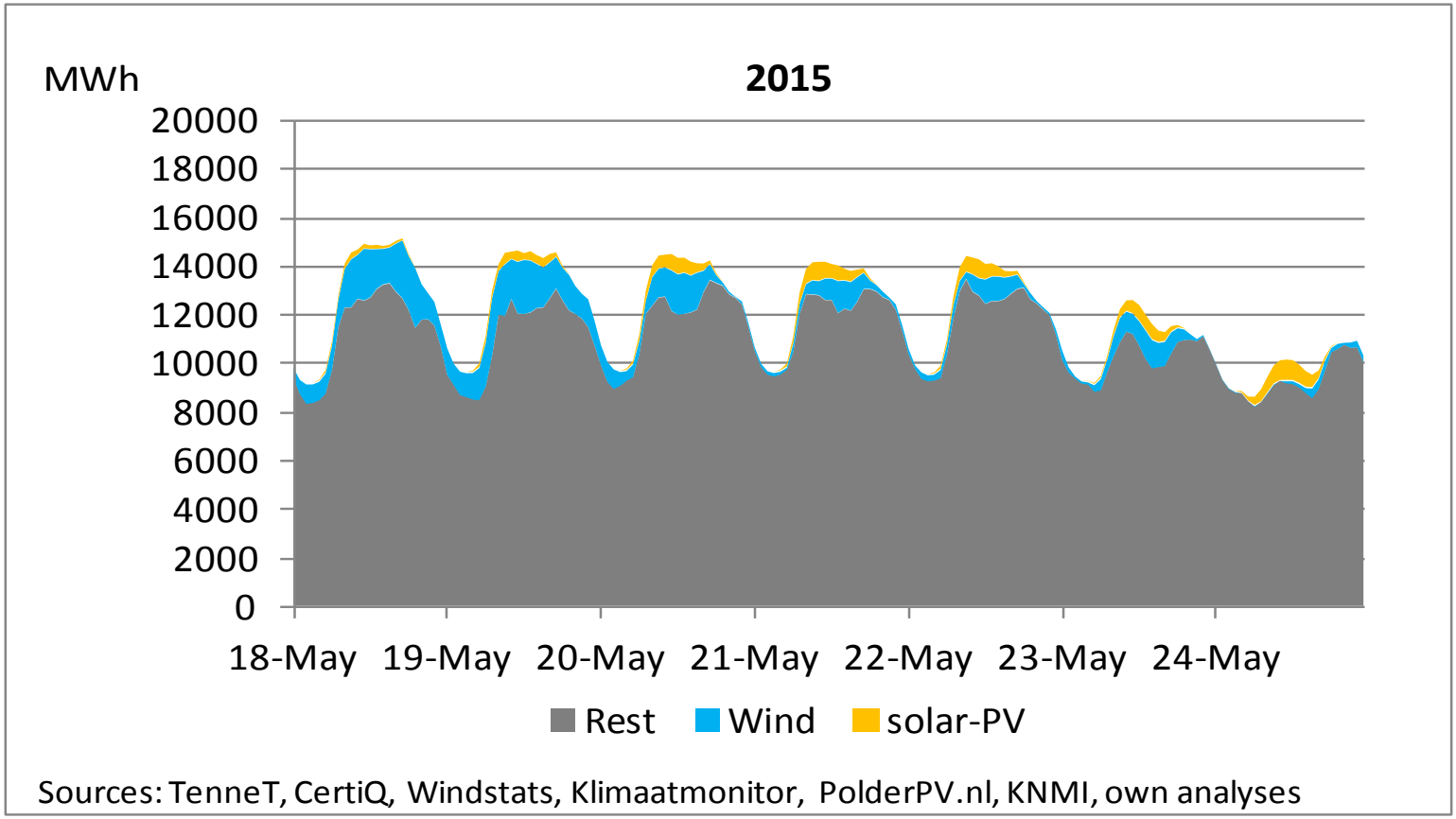

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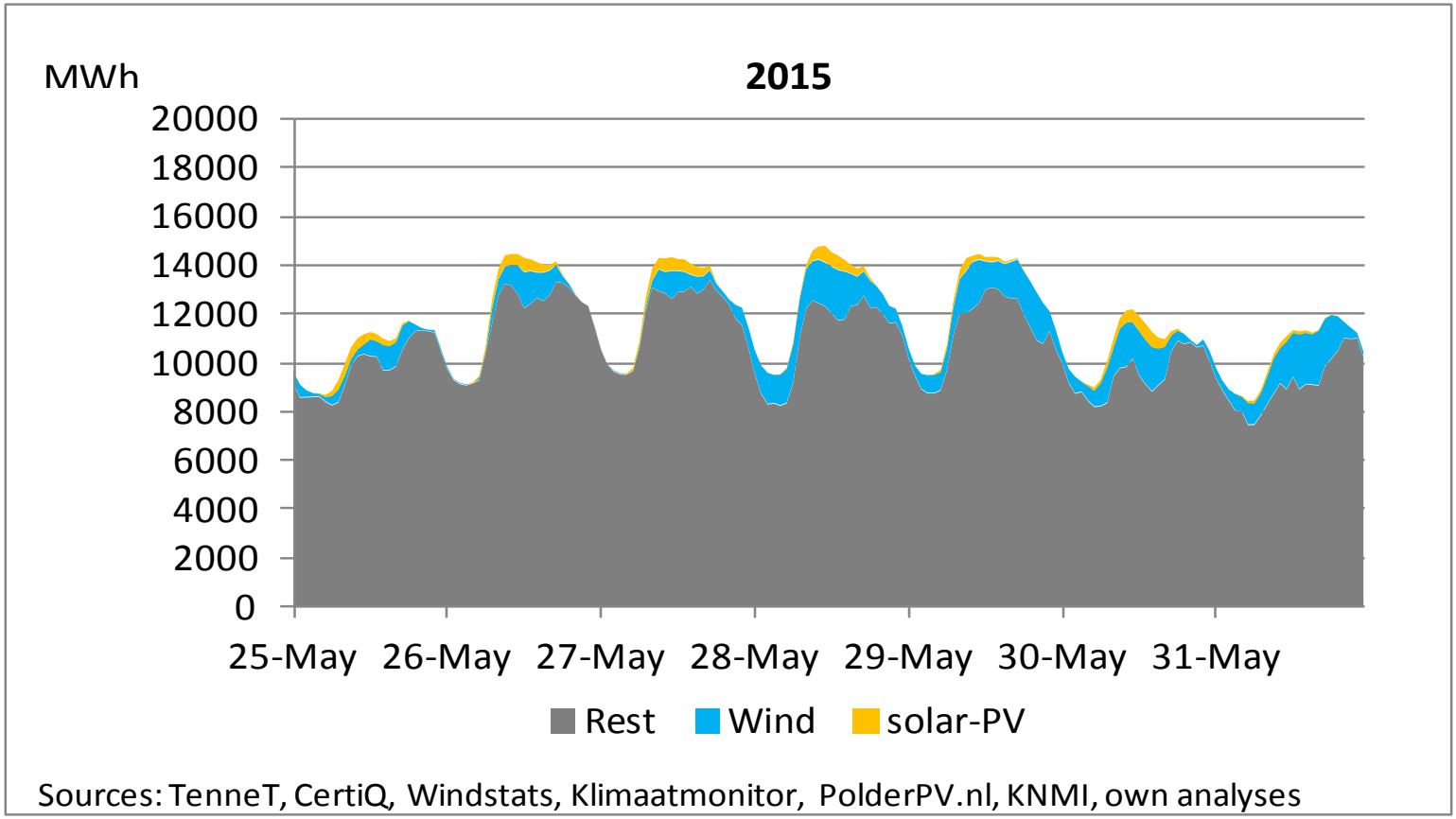

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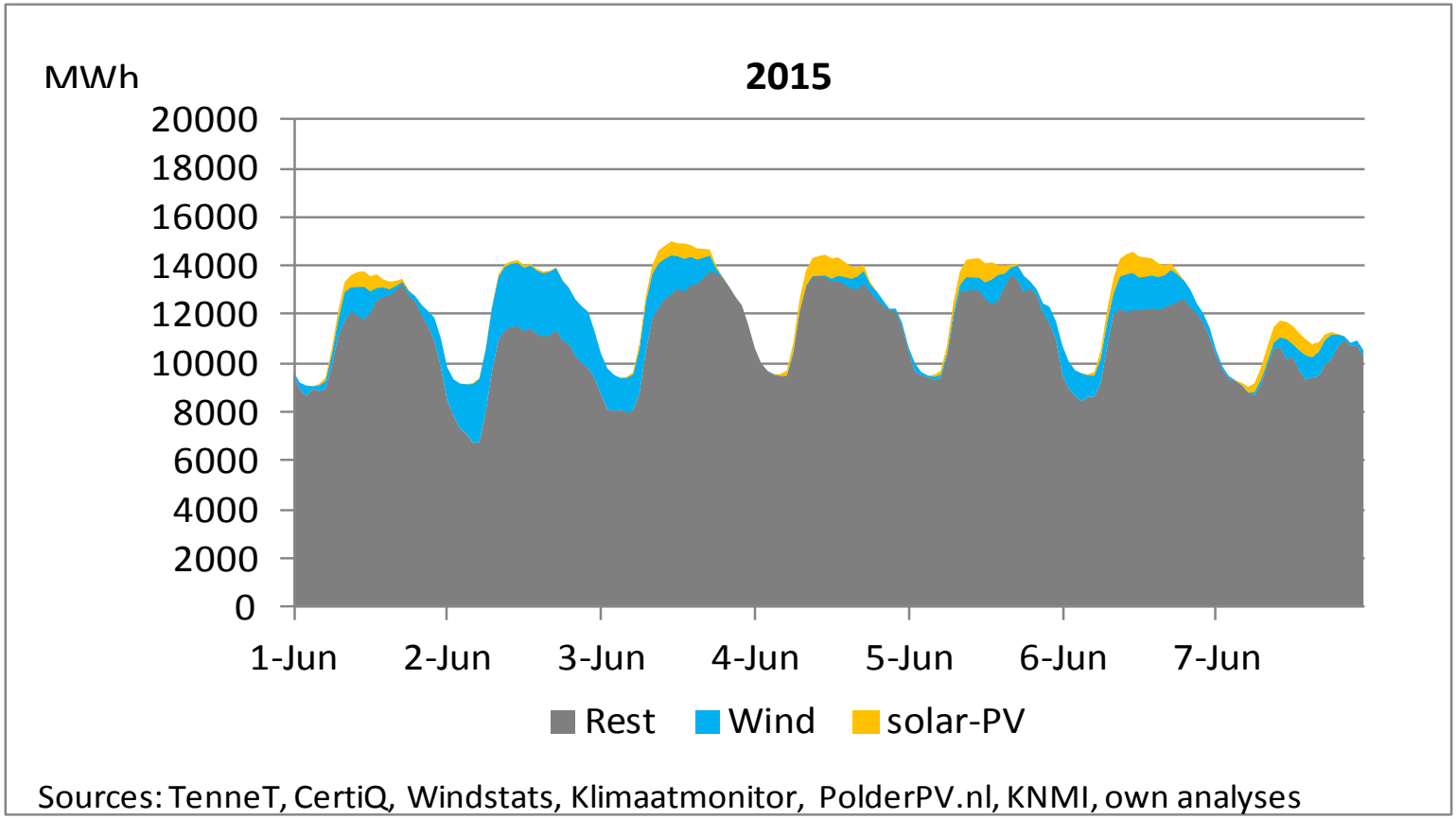

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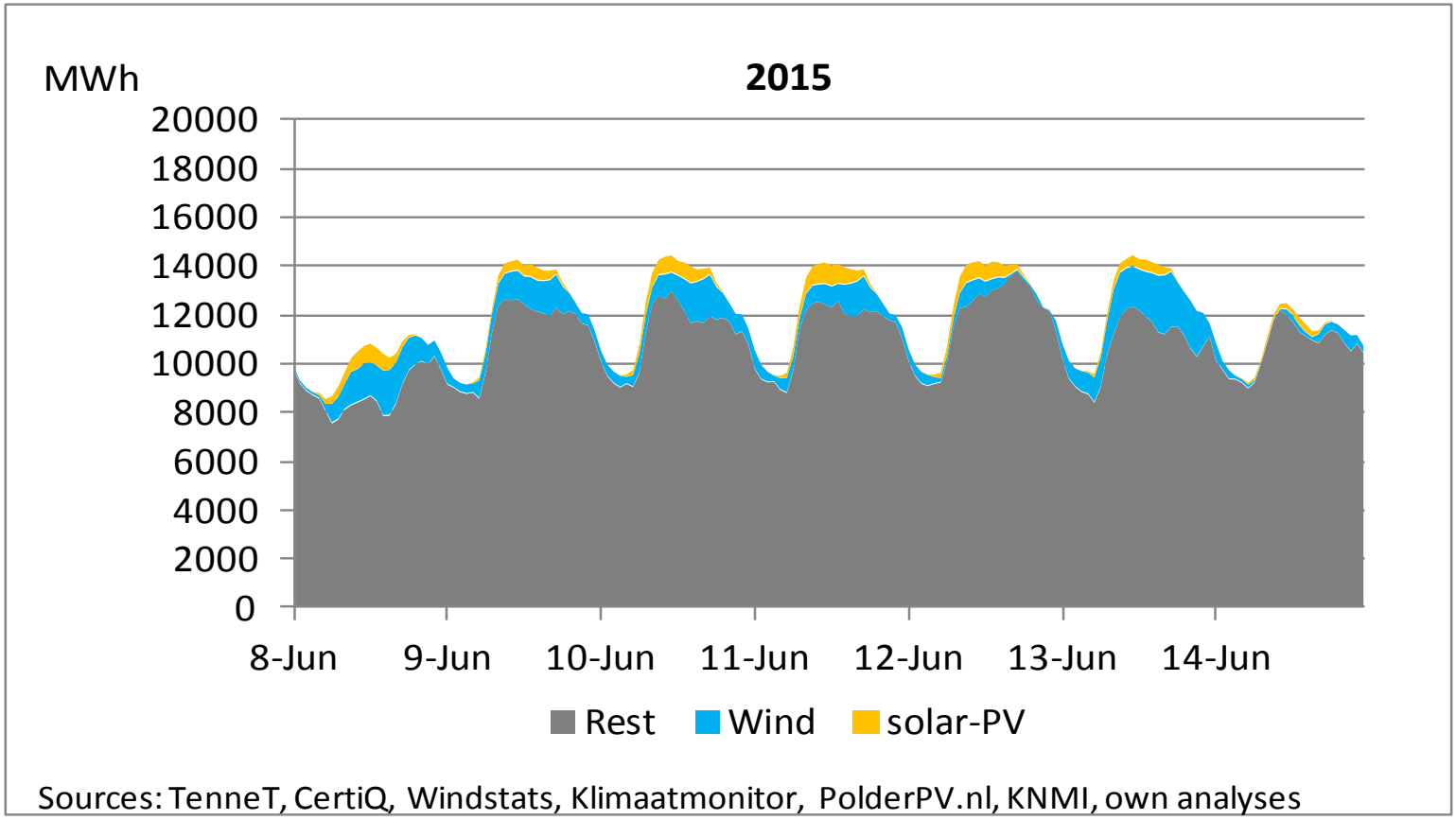

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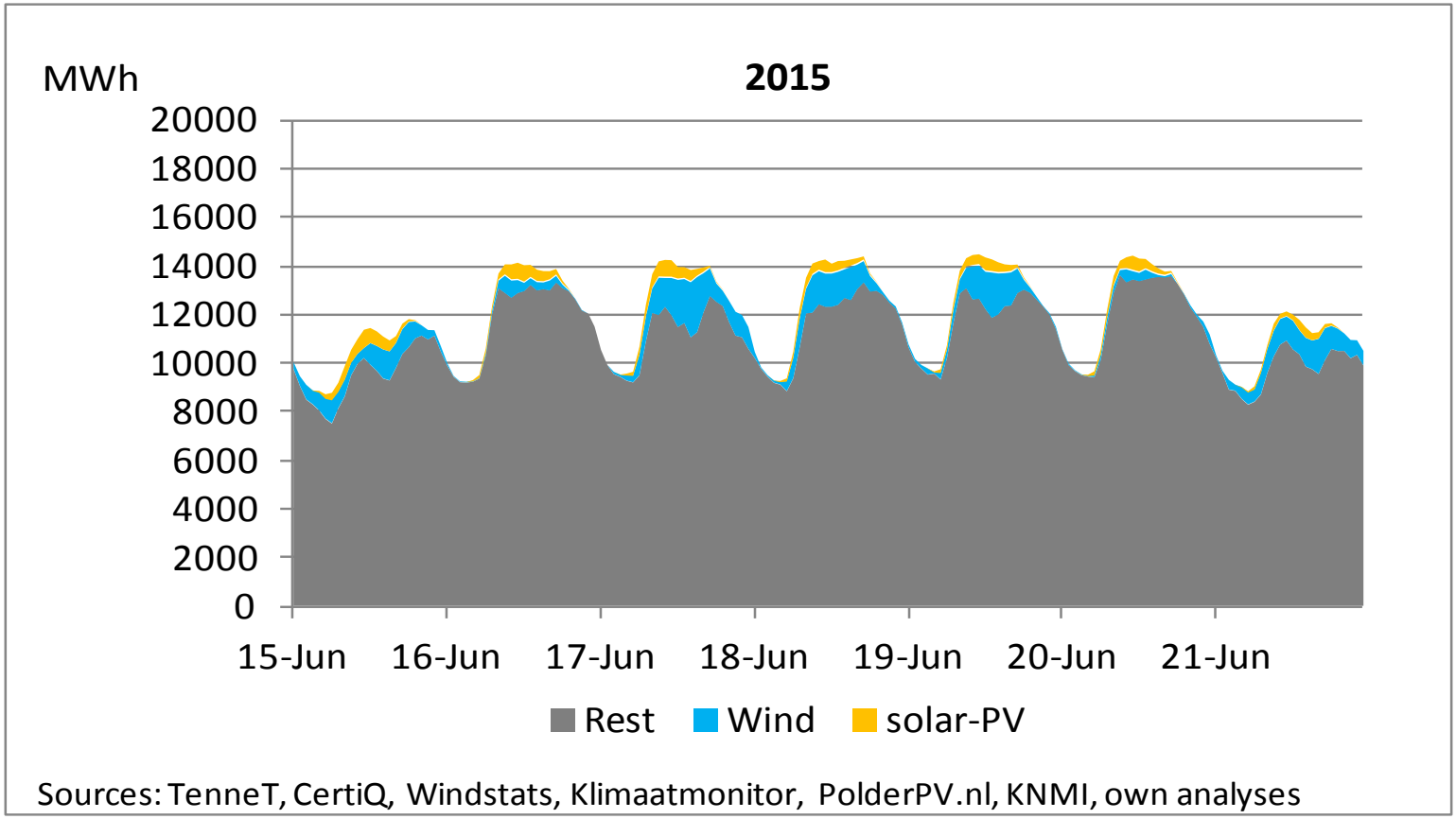

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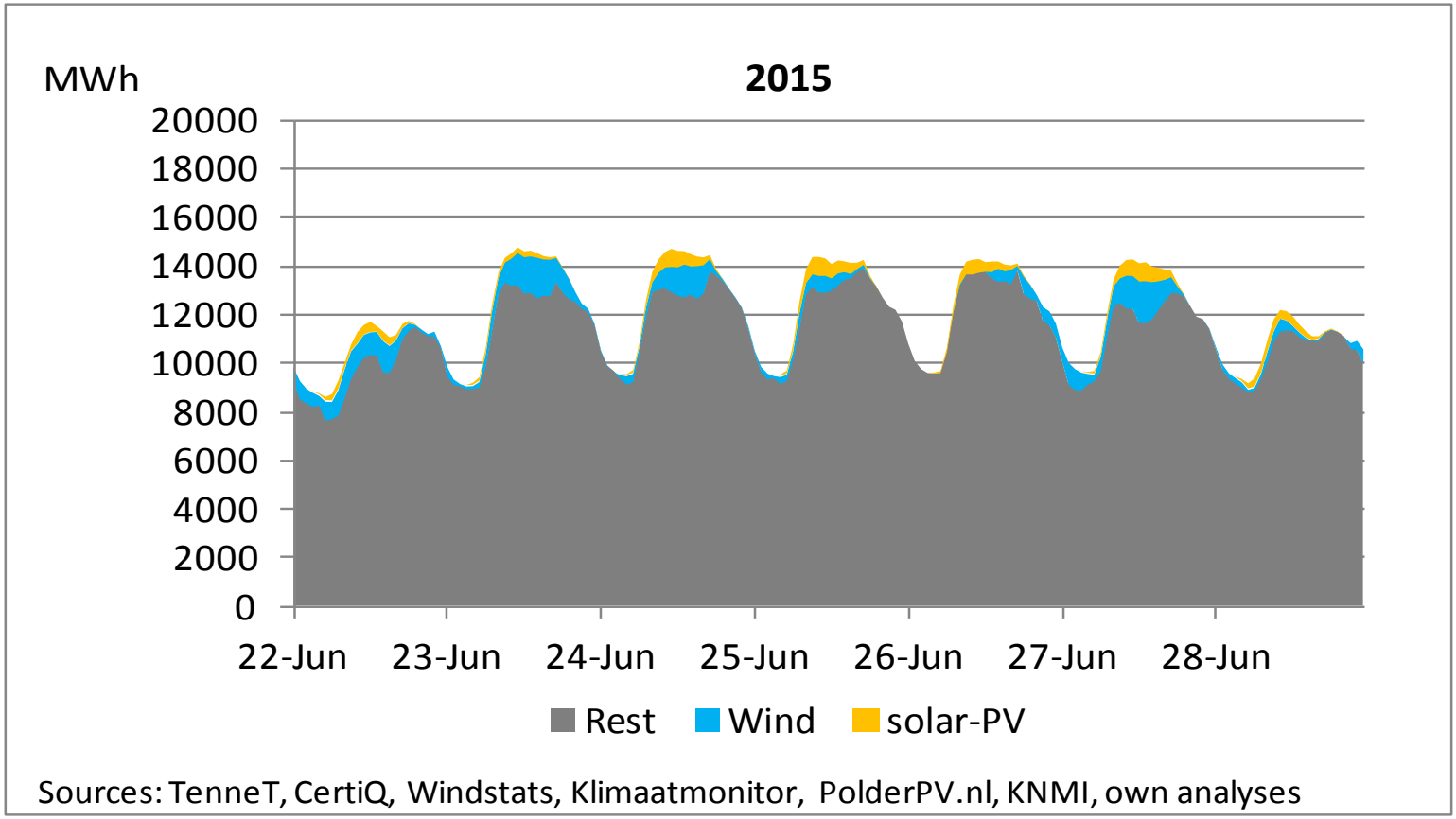
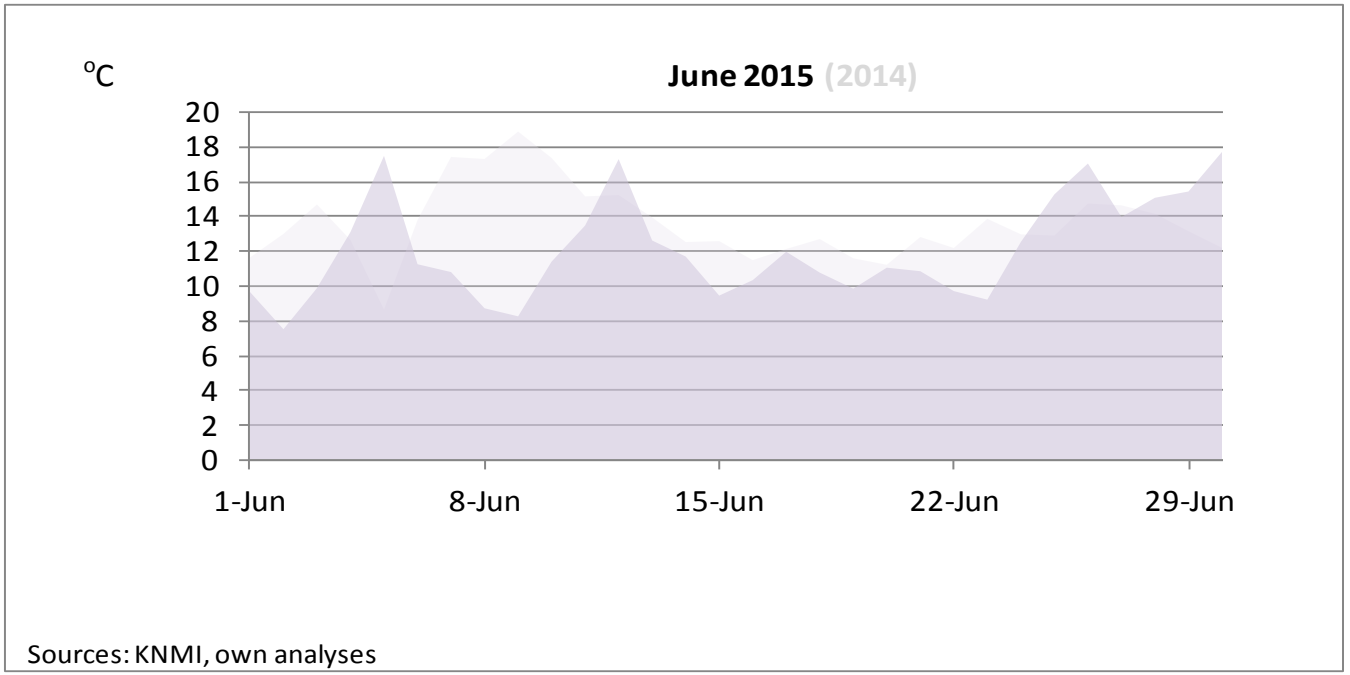


Sources: TenneT, CertiQ, Windstats, Klimaatmonitor, PolderPV.nl, KNMI, own analyses

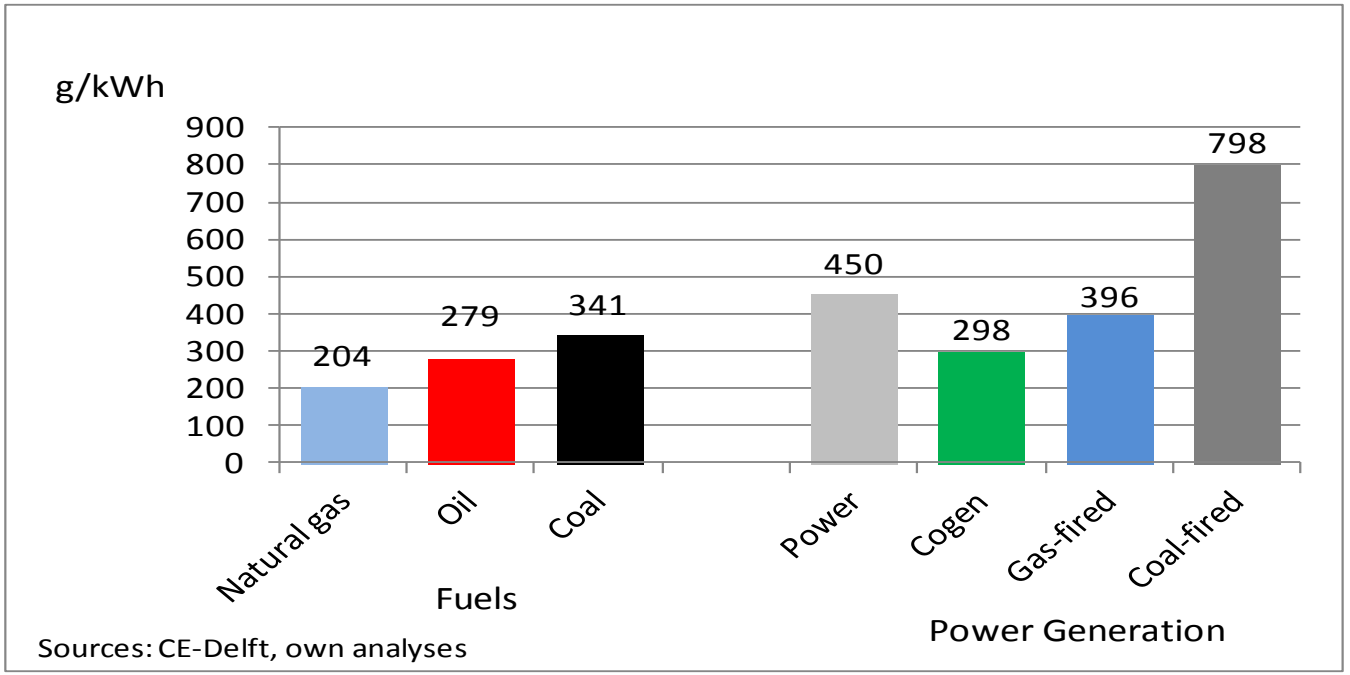
MISCELLANEOUS

Effective Temperature 2015



The effective temperature (temperature including wind shield factor). June registered colder temperatures than last year. For comparison, effective daily temperatures of June 2014 are presented at the background.

Fuel Specific CO2 Emissions



Characteristic CO2 emissions used in this presentation.

Epilogue

b.m.visser@pl.hanze.nl

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This presentation is based on numerous sources which present data on energy demand and supply in The Netherlands. These data, however, do not cover the entire energy system. Some approximations and scaling factors were thus needed. The author would like to thank students from Hanze University of Applied Science in Groningen and various energy experts in The Netherlands which gave suggestions for improvements of the methods used. Currently, the aggregated results of this work are in good agreement with data supplied by the Dutch National Office of Statistics (CBS). It is believed by the author that the detailed results in this presentation give a fair presentation of the complex reality of the Dutch energy system.

Nevertheless, the author invites readers to comment on the data provided with the objective to further improve this work. After all, good and reliable data are at the heart of any successful policy to make our world more sustainable.